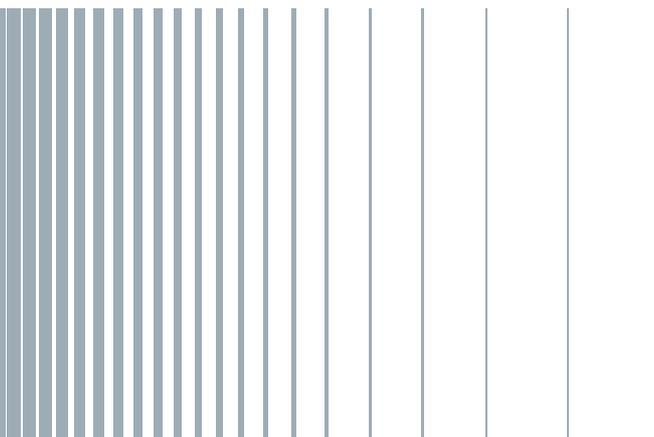


# R&S® CLIPSTER®

Software Guide



**ROHDE & SCHWARZ**



**Document**      Software Guide

**Version**        User Guide Version 5.10

**Product**        R&S®CLIPSTER®

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# Basics

This chapter contains information about the structure of the R&S DVS software which includes a short overview of its different modules. Furthermore, it provides some general notes and background information required when working with the software.

This chapter is divided into the following sections:

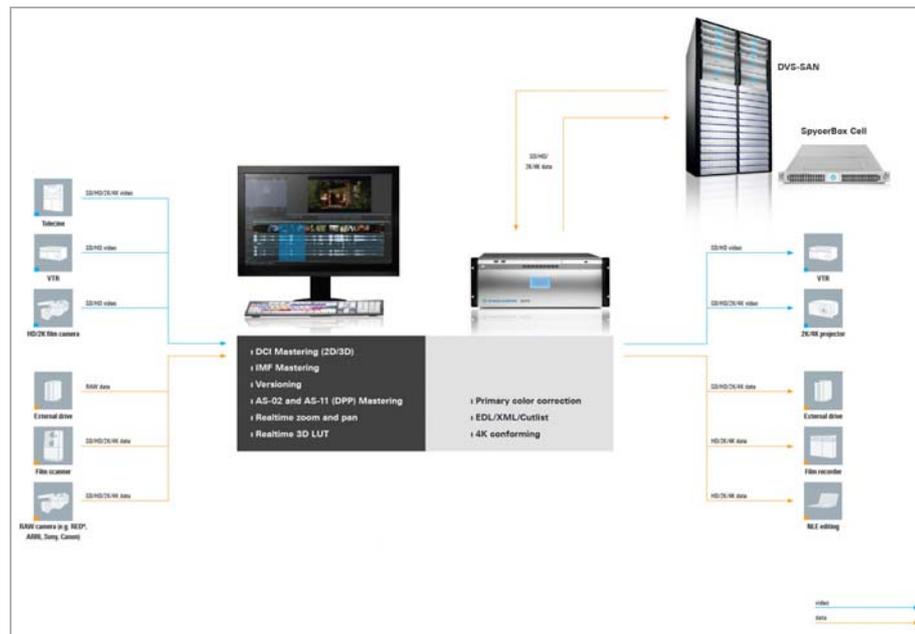
- Product Description (page 14)
- Important Notes (page 16)
- Software Structure (page 17)
- Working in Realtime (page 21)
- Notes on Project Management (page 24)
- Working with JPEG2000 and Raw Content (page 25)
- Source Timecode (page 28)
- Keycode (page 29)
- Timecode / Frame Numbers Fields (page 30)



## Product Description

CLIPSTER offers capturing, online editing and storing of digital film and audio data in one device. The system performs all works in realtime.

Video data is stored and worked with in its original uncompressed format (or compressed), independent of resolution, color space and bit depth. All formats and resolutions can be processed, from SD up to 4K, and the final result can be played out in a freely selectable format. Conversions and calculation times for render processes are rarely necessary because of the high-quality hardware developed by R&S DVS. Additionally, up to 16 channels of audio can be in- or output by CLIPSTER and their data can be accessed and processed in the software as easily as the video material. All video and audio data are stored in the Windows file system and thus accessible right away when working with other applications.



The software enables you to add video and audio clips to a time-line in any sequence you like and in a freely configurable number of tracks. When working with video you can edit your material with cuts, dissolves, wipes, etc. as well as e.g. scalings, pannings, zoomings, and/or color corrections.



When working with audio, you can control the volume of a clip at every position in the timeline, for example, to create fade-ins and -outs. During all times your original material is never touched or altered because all editing timeline processes are performed virtually. To provide for the best possible integration, the software supports edit decision lists of various formats via import and export functions. For conforming or the mastering of digital cinema content there are also advanced tools available. For the mastering of digital cinema content there is also an advanced tool available. Once your project is finished, you can finalize it and save the edited clips in any video and file format you like.

Further important features:

- Projects can be finalized to one or more clips (render function)
- Automatic and adaptable scaling of video material in the timeline (autoscale)
- Effects operators, e.g. for zoom/pan, flip/flop or color corrections
- 1D and 3D LUT support
- Hardware accelerated JPEG2000 handling including realtime playout of JPEG2000 encoded material
- Multi-device operation mode that enables a synchronous playout/record of multiple DVS systems
- Projects can be built up via import or loading of a data list (e.g. ALE, EDL or cut list)
- Advanced conforming tool (conforming mode in the control area)
- Easy to use digital cinema delivery tool
- Archive function for projects.



## Important Notes

Please observe the following when using the software:

### **NOTICE**

#### **Performance Loss**

Other storage locations will be too slow for real-time operations.

**Only use the designated video drive (main storage) to store video data.**

**Leave about 15% of the overall main storage capacity empty for realtime performance reasons.**

### **NOTICE**

#### **Realtime Performance**

The realtime capability of the CLIPSTER depends to a large extent on the performance of the system's hardware.

**It is recommended to terminate all other programs when working with the R&S DVS software.**

### **NOTICE**

#### **Third-party Software**

Your R&S DVS system has been tested thoroughly and is very reliable. However, because of the vast amount of third-party software available, its reactions on the installation of such could not be tested. The installation of third-party software may disrupt the real-time capability and/or limit the functionality of your system.



## Software Structure

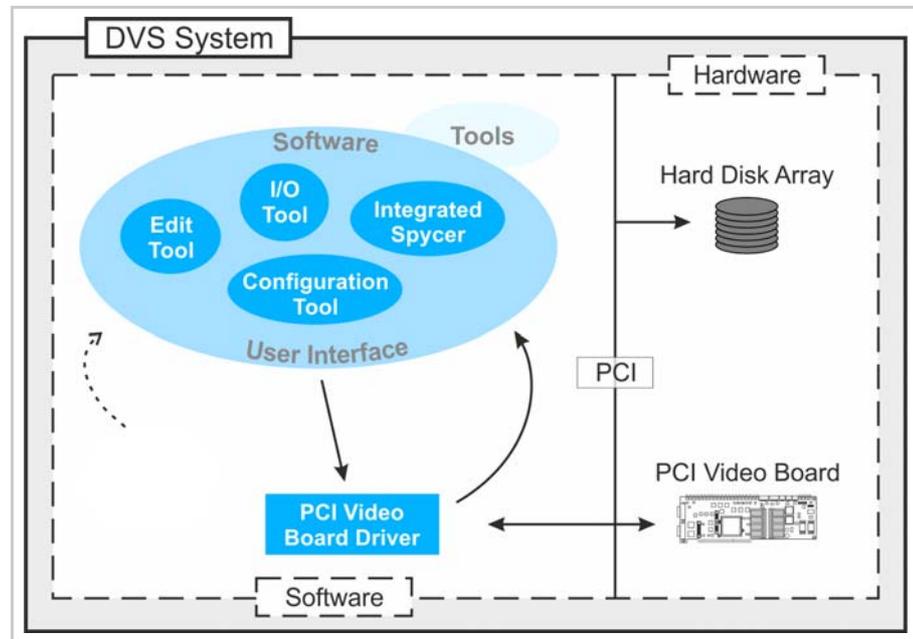
The software package for the DVS system consists of various individual modules that combined provide the system's unique capabilities to process digital video in realtime.

The following topics are covered:

- Overview (page 18)
- Module: Edit Tool (page 18)
- Module: I/O Tool (page 19)
- Module: Integrated Spycer (page 19)
- Module: Configuration Tool (page 20)

## Overview

The following diagram shows the communication processes between individual software modules and some hardware components in detail:



Depending on your system configuration there may be other tools and modules available on your system. Further information about these can be found in their respective user guides.

Once the R&S DVS software is started, you can access the different modules available on your system via the task bar of the user interface.



Task bar of the user interface

## Module: Edit Tool

The Edit Tool is the software module that allows you to assemble video and audio material on a timeline and edit them with cuts, dissolves, wipes, etc. Clips of different formats and resolutions can be added to the timeline and processed, for example, via color corrections, scalings or zooming and panning. Additionally,

in this module you can perform a DCI Mastering and create properly encoded and encrypted digital cinema packages (DCPs). The Edit Tool module supports edit decision lists of various formats via its sophisticated conforming tool, allowing you to import data lists, conform them, work with the built-up timeline freely, and afterwards export your work to a new edit decision list function (capturing via the I/O Tool, build-up of the timeline in the Edit Tool; any assembled timeline can be exported as well). All editing tasks are performed virtually, i.e. the original material on the storage is never altered. The clips used in the DVS software are only representations of the original material on the storage.

### **Module: I/O Tool**

The optionally available I/O Tool is mainly used for the digitization of a variety of different input sources, meaning the recording/capturing of video and audio data with the R&S DVS system from other sources than computer storages. You can capture material from any source you like and record it in a freely selectable format, with or without color space conversion. For instance, you can capture data from telecines, VTRs, or even cameras – as desired in an automated batch processing mode or manually. Of course, playing out the recorded material as well as of all other clips present on the system can be performed without any effort as well. Furthermore, the processing of data lists is fully supported in the software, for example, via import and export functions (import via the I/O Tool and export via the Edit Tool).

### **Module: Integrated Spycer**

With Spycer, the innovative content management software by R&S DVS, you can manage your content easily. It is a software application capable of handling large amounts of video data and their corresponding metadata, providing you with integrated browse, search and management tools to retrieve data and gather information about them locally as well as via a network. Additionally it can be used to preview clips and add them to the bin of the software, thus offering you even more possibilities than a file manager. Spycer is already integrated in the R&S DVS software. It can be accessed the same way as the other software modules and is thus not needed as a stand-alone application. CLIPSTER works seamlessly together with other available R&S DVS products.



## Module: Configuration Tool

For the configuration and setup of the whole DVS system and its software you can use the Configuration Tool. Here you can set up, for example, the period for the automatic save function of the project file (autosave) as well as more software specific settings, such as the bin properties.

## Working in Realtime

When playing out or recording, the CLIPSTER by default is capable of handling resolutions up to 4K in realtime. The usage of a 3D LUT, cropping, zoomings and pannings, and primary color corrections, can be performed in realtime as well.

However, when using other effects (e.g. secondary color correction) or clips of an even higher resolution, a realtime processing may no longer be possible. In such a case the system offers two different approaches to maintain a realtime workflow as long as possible: You can work with proxies or you can prerender the material and/or operators prior to a playout:

- Working with Proxies (page 21)
- Working with Prerendered Data (page 22)

### Working with Proxies

A proxy is a downscaled version from a clip of a higher resolution. Usually, proxies will be used as a substitute for high-resolution film material, such as 4K or higher. The original data will then be downconverted to a 2K format that can be handled by the R&S DVS software and system in realtime.



When working with proxies or prerendered files, additional data (image files) will be created on your main storage. It is recommended to store these project specific for each project separately.

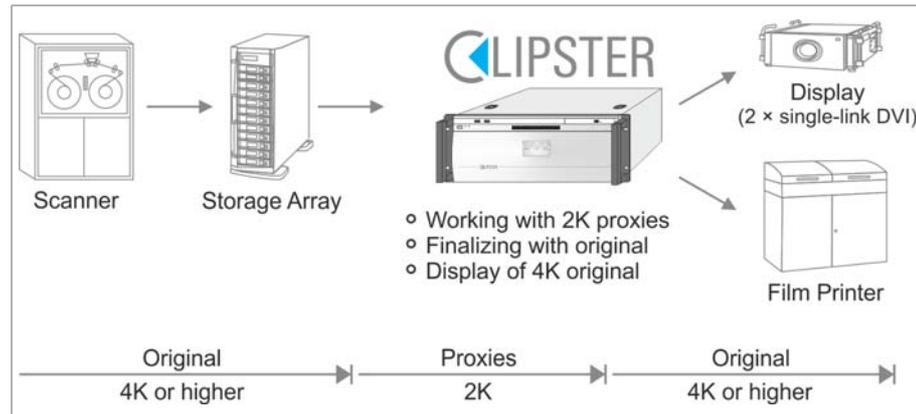
You can set the storage location of such files for each project differently via the Configuration Tool on the tab **Project** (group **Project**, field **Path for proxy data**).

In this workflow you will add the high-resolution clips as usual to the bin. But prior to using them in the timeline you will create proxies of them. The downconverted images of the proxy will be stored in a reserved location for temporary data on the main storage.

The stored proxies carry project specific file names that are generated and administered by the Edit Tool automatically for the currently loaded project. The links to the proxies will be stored in the project file, and when reopening the project again you will not have to create them again. When working with proxies, a lot of image files may be generated amounting to a large proportion of disk space.



Once a proxy has been created, it will be available in the bin instead of the original high-resolution clip. Nevertheless, the bin clip and all its representations in the timeline are still linked to its original material and by turning the proxies on or off you can decide whether the material of the higher resolution should be used or the proxies. Thus you can work with the downconverted clips as usual in the timeline but when playing out or finalizing you can switch back to the original material in high resolution.



With this workflow you will be able to finish, for example, a conformed high-resolution project with 2K proxies in real time by using transitions, color corrections, zoomings as well as panning, and/or other editing features. Once your job is done, the DVS system can finalize (render) the whole project from the original high-resolution material.

## Working with Prerendered Data

Prerendering generates proxies from clips and operators added in the timeline that are not realtime capable. A prerendering means that the Edit Tool calculates the respective clips and operators (effects) before a playout takes place and stores the calculated extra files (rendered images) in a location for temporary data on the main storage. These proxies are then used for a playout instead of the original material in the timeline and on-the-fly handled operators.

Depending on your system capabilities all timeline elements, i.e. clips as well as operators (such as transitions or color corrections), can be subject to a prerendering. For example, when using a type of clip that exceeds the realtime capability of your system, it will be marked visibly in the timeline as not realtime capable. In order to play it out in realtime, you will have to prerender it



beforehand and it will be rendered in the format that is currently set as the video output format. The prerendered proxies carry project specific file names same as the proxies created from the bin and are generated and administered by the Edit Tool automatically. The links to prerendered proxies will be stored in the project file, and when opening the project later again, it will not be necessary to re-render them.

When working with prerendered data you may get proxies on the storage that are no longer required for your current project but occupying disk space. This will happen as soon as a timeline element was prerendered and afterwards deleted or changed. Even a switching of the video format will make the already prerendered data obsolete due to the fact that the extra images may no longer coincide with the newly selected format. Because the software can never be sure when proxies are truly obsolete for a project, they will remain on the storage of your system. Nevertheless, to delete prerendered data, you can use the menu option **Delete prerendering** on the context menu of a video clip.



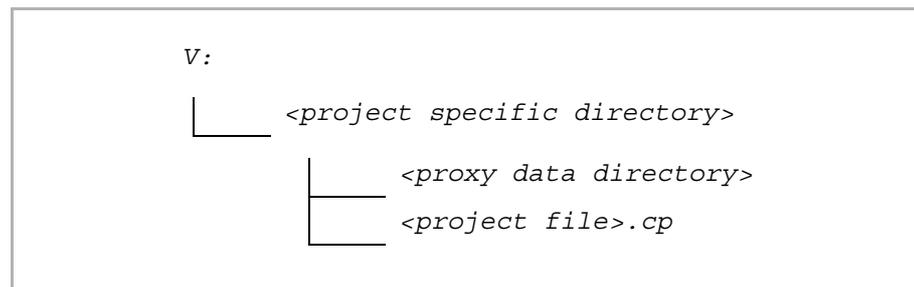
It is recommended to store prerendered data for each project separately.



## Notes on Project Management

To display material of a very high resolution or to enable a real-time playout of some certain high-resolution clips and operators (e.g. the secondary color correction transitions), the DVS system may create proxies as well as prerendered files. Both ways to maintain a realtime workflow are based on the same principle: They use calculated extra files to either enable a playout (prerendering) or make your working environment more comfortable (proxy generation).

The location where these extra files are stored is saved project specific in the project file, i.e. each project file can have a different directory for proxy data and the exact location will be stored in the project file. Therefore, it is suggested when working with proxies or prerendered material, to store the project's data in a directory of its own. R&S DVS recommends, when working with different projects, to create for each project a project specific directory on your main storage to save the project file. Beneath it, create a subdirectory for the additional data:



Folder structure for project management

This structure guarantees a clear and easy to manage project.

You can set the storage location of such data for the currently loaded project with the Configuration Tool of the R&S DVS software in the group **Project** of the **Project** tab.

## Working with JPEG2000 and Raw Content

CLIPSTER allows you to work with JPEG2000 and/or raw content in realtime. This enables, for example, the use of 4K JPEG2000 material or the original 4K REDCODE data in 12 bit directly without any preconversion.

The following topics are covered:

- Working with JPEG2000 Data (page 25)
- Working with Raw Data (page 26)

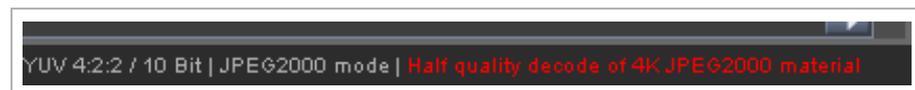
### Working with JPEG2000 Data

When the hardware operating mode is set to the 'JPEG2000 mode', the hardware is optimally configured for working with JPEG2000 material. This is required when creating DCPs with the DCI Mastering feature of CLIPSTER.

Such complex workflows, however, require lots of resources. For this additional, optionally available hardware may be needed (i.e. a second hardware accelerator board). The menu option **Hardware operating mode...** on the menu **Options** allows you to switch between the different hardware operating modes.

With only one hardware accelerator board present in the system (default hardware configuration), a realtime DCI decoding of 4K JPEG2000 material will not be possible. However, with such a hardware configuration there is still an option available that allows you the decoding of 4K JPEG2000 material at 2K, and thus enabling a realtime playout. It is called „half-quality decode of 4K JPEG2000 material“ and can be activated or deactivated in the Configuration Tool on the tab **Project** or **Defaults** (setting **Half resolution decode of 4K JPEG2000 material** in the group JPEG2000 Compression; see Configuration Tool user guide).

The half-quality decode mode will be displayed among the project information at the bottom right of the software.



Hardware set to half-quality decode of 4K JPEG2000 material



The half-quality decode mode is available only for playout and will not be used for finalizing.

The decoded 4K JPEG2000 will be automatically scaled to 4K.

## Working with Raw Data

Most raw material can be processed in either hardware operating mode except for ARRI ALEXA and REDCODE material. For video material from the ARRI ALEXA camera you have to use the 'ARRI ALEXA-certified mode' and for REDCODE material from the RED EPIC or RED ONE cameras you have to use the 'raw mode'. Both can be activated through the "**Options > Hardware operating mode...**" menu item.

### Raw Data Processing

Raw data can be loaded into the software and used as any other material in the timeline. It does not require any rendering or preprocessing. In case the video data comes in a container file format together with audio and/or metadata, they will be used as well. If the data is split into several clips, the software can detect this and use it as a single clip.

After adding to the timeline, the video clips are sometimes provided with special effects operators automatically. The following table shows the raw content that can be loaded and their accompanying effects operators:

Raw Content	Effects Operator
ARRI Raw (*.ari)	'ALEXA RAW decode' or 'D-21 RAW decode' depending on the type of camera the material was recorded with. They color correct the raw data of the cameras.
F65 Raw (*.mxf)	'F65 RAW decode' which controls the color correction and camera parameters of the F65 raw data.
REDCODE (*.r3d)	'R3D RAW Decode' which controls the camera parameters of REDCODE raw data.

Raw Content	Effects Operator
Phantom Cine Raw (*.cine)	'1st color correction' which applies the color correction as specified in the file header of Phantom Cine Raw data.
CineForm Raw (*.avi, *.mov)	'1st color correction' which applies a 1D LUT as specified in the file header of the data.

### RED EPIC 5K Transcoding

With CLIPSTER it is possible to transcode 5K RED EPIC material into 5K DPX files in real time. However, then only the first color correction operator will be processed. All other operators applied to the RED material in the timeline including a 3D LUT will be ignored.

### 8-bit Decoding of EPIC Material

When only one hardware accelerator board is present in the system (default hardware configuration), a real-time decoding of EPIC material at 12 bit color depth will not always be possible. However, for such hardware configurations there is still an option available that allows you the decoding of EPIC material at 8 bit color depth, and thus enabling a real-time playout. The setting **8-bit decoding of EPIC material** can be activated or deactivated in the Configuration Tool.

The 8-bit decode mode will be displayed among the project information at the bottom right of the software same way as the half-quality decode mode of 4K JPEG2000 material.



The 8-bit decode mode is available only for playout and will not be used for finalizing.



## Source Timecode

Some file formats for clips, e.g. \*.dpx files, are capable of storing more information than just their image content. These information are usually written in a specified format into the file headers which can be read and interpreted by different software applications that support these kind of information. Among the information stored you can find, for example, the name of the creator (usually the program that created the files), the creation time and date, and the timecode.

Timecode information stored in file headers (the so-called source timecode) can be used in the whole R&S DVS software. For example, you can use source timecodes in the timeline of the Edit Tool and regardless of their position in the timeline the respective clips will always show and use their source timecode. Then, prior to a playout you can decide whether the internal timeline timecode should be given out as a timecode signal or the source timecodes provided by the files.

Regarding source timecode there are some peculiarities how the R&S DVS software deals with source timecodes. Some of them are detailed in the following:

Normally, image files capable of storing timecode information provide space for one timecode only in their header (generic source timecode). R&S DVS systems, however, are able to receive (e.g. during a record) several timecodes incorporated in signals at various connectors. During a write procedure, i.e. when recording clips via the I/O Tool (\*.dpx files), they will write the received timecode information into the file headers. The ones additionally received will be stored at a location for user defined data in the header and usually cannot be interpreted by applications other than the ones developed by R&S DVS. When processing such clips afterwards, for instance, in the timeline of the Edit Tool or when conforming, you can select between the various timecodes provided by the clips which may give you more control over their position in the timeline.



REDCODE files store two timecodes ('Time Of Day' and 'Edge Code') which you can select in the software as well.

Audio files equipped with source timecode usually provide a start timecode only. Subsequent timecodes will be calculated and drop-frame timecodes are currently not supported.

## Keycode

Keycode information stored in file headers can be used in the software, for example, during a conforming process (see chapter "Conforming Tool" (page 461)).

Keycode has its origin in the film world and is a variation of time-code to identify frames on a film roll. It is a machine-readable code printed at certain intervals along the edge of the camera negative film outside the perforations. Besides containing data, for instance, about the film type, the name of the manufacturer and the film stock, it is used to number individual images, i.e. it provides a reference number (**<count>+<offset>**) for the image where the keycode is written. The numbering available via keycodes can be used, for example, to match the film with a particular position of a data list (e.g EDL or cut list).

In the R&S DVS software the keycode format normally is:  
**<manufacturer ID and film type><6-digit film roll ID> <count>+<offset>**

### Example

**KK217312 5235+04**



## Timecode / Frame Numbers Fields

The R&S DVS software provides various fields where data in timecode format is provided or an entry in such a format is necessary. The timecode format is **hh:mm:ss:ff** (hours, minutes, seconds, and frame number).

The following topics are covered in this section:

- Drop-frame Timecode Indication (page 30)
- Higher Frequencies and Timecode Format (page 30)
- Entering Timecode (page 31)
- Switching the Notation (page 32)

### Drop-frame Timecode Indication



If **--:--:--:--** or **---** is displayed in an entry field, a value has not been specified so far.

The last colon of the timecode format may be displayed in the software as a full stop. Then the timecode fields of the software will display, for example, **12:25.07** instead of **12:25:07**. This indicates that the drop-frame timecode feature is activated. When entering timecode, the last colon can also be replaced by a full stop.

### Higher Frequencies and Timecode Format

In the user interface of the software an asterisk may be added to the timecodes (e.g. **12:25:07\***). This will be the case when the video raster's frequency exceeds 30 frames per second because the original timecode format is limited to frame rates as high as that. To account for video rasters with higher frequencies (e.g. 60 Hz), one timecode number is used for several video frames, meaning every second, third or fourth timecode provides the same timecode number (the frames notation (see below) is not affected). These repeated timecodes are shown in the user interface with an added asterisk and at the outputs they are particularly flagged as well. The standard timecodes that will be used for such procedures are 24 Hz, 25 Hz and 30 Hz: For example, a video raster frequency of 48 Hz is provided with a 24 Hz timecode, while a 60 Hz frequency receives a 30 Hz timecode. This will result in a doubling of the timecode numbers:



60 Hz @ 30 Hz TC	60 Hz
...00:00	...00:00
...00:00*	...00:01
...00:01	...00:02
...00:01*	...00:03
...	
...00:29	...00:58
...00:29*	...00:59
...01:00	...01:00
...01:00*	...01:01

At even higher frame rates (e.g. 90 Hz) the timecode numbers will be tripled, quadrupled etc., making a timecode handling of all common frequencies possible.

## Entering Timecode

When entering timecode in one of the software's position or length indicators, you may omit digits: if you enter less information, the entered timecode will be interpreted from right to left (the last number is the frame, the next the seconds, etc.). Every digit omitted between the colons is assumed to be a leading zero.

You may also omit the separators (colons). However, then you should observe that no digits are left out: With omitted separators the entered timecode will be interpreted from right to left (the last two numbers indicate the frame, the next two the seconds, etc.).

After pressing [Enter] on your keyboard the entered timecode is accepted in the respective timecode field, for example, to move to a certain position:

Examples		
	1:9	jumps to 1 sec. frame 9 (00:00:01:09)
	109	jumps to 1 sec. frame 9 (00:00:01:09)
	247	jumps to 2 sec. frame 47 (00:00:03:23 if raster is in 24p)

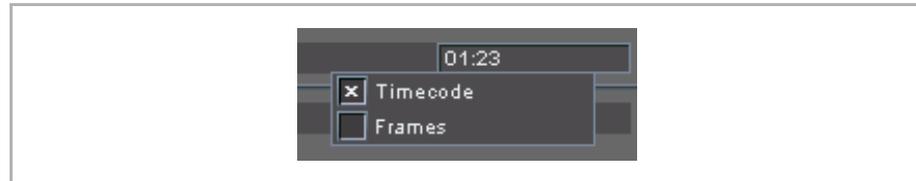


Additionally, in most position or length indicator fields you can enter a new value by either adding or subtracting the timecode or the frame amount from the given entry. For this simply add the timecode or frame amount with a minus or plus sign (-/+ ) to the given entry in the timecode/frame number field. After that press **[Enter]** to confirm your entry.

<b>Examples</b>	1:23+2:05	jumps to 4 sec. frame 4 (00:00:04:04 if raster is in 24p)
	4:04-53	jumps to 1 sec. frame 23 (00:00:01:23 if raster is in 24p)

### Switching the Notation

Scales (e.g. on timelines) and position and length indicators can be switched from a display of the timecode notation to frame numbers and vice versa. For this it is best to use the context menu of a timecode/frame number field (e.g. the position field of the timeline cursor, see section “Controls” on page 96).



Select from the context menu the respective menu option. This will change the position and length indicators of the respective software module to the selected.



A switching of the notation may effect the selected display type (internal frames/timecode will be used) and vice versa.



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# Getting Started

This chapter provides a basic overview of the start-up user interface. Further, it explains how to switch between the different software modules.

The chapter is divided into the following sections:

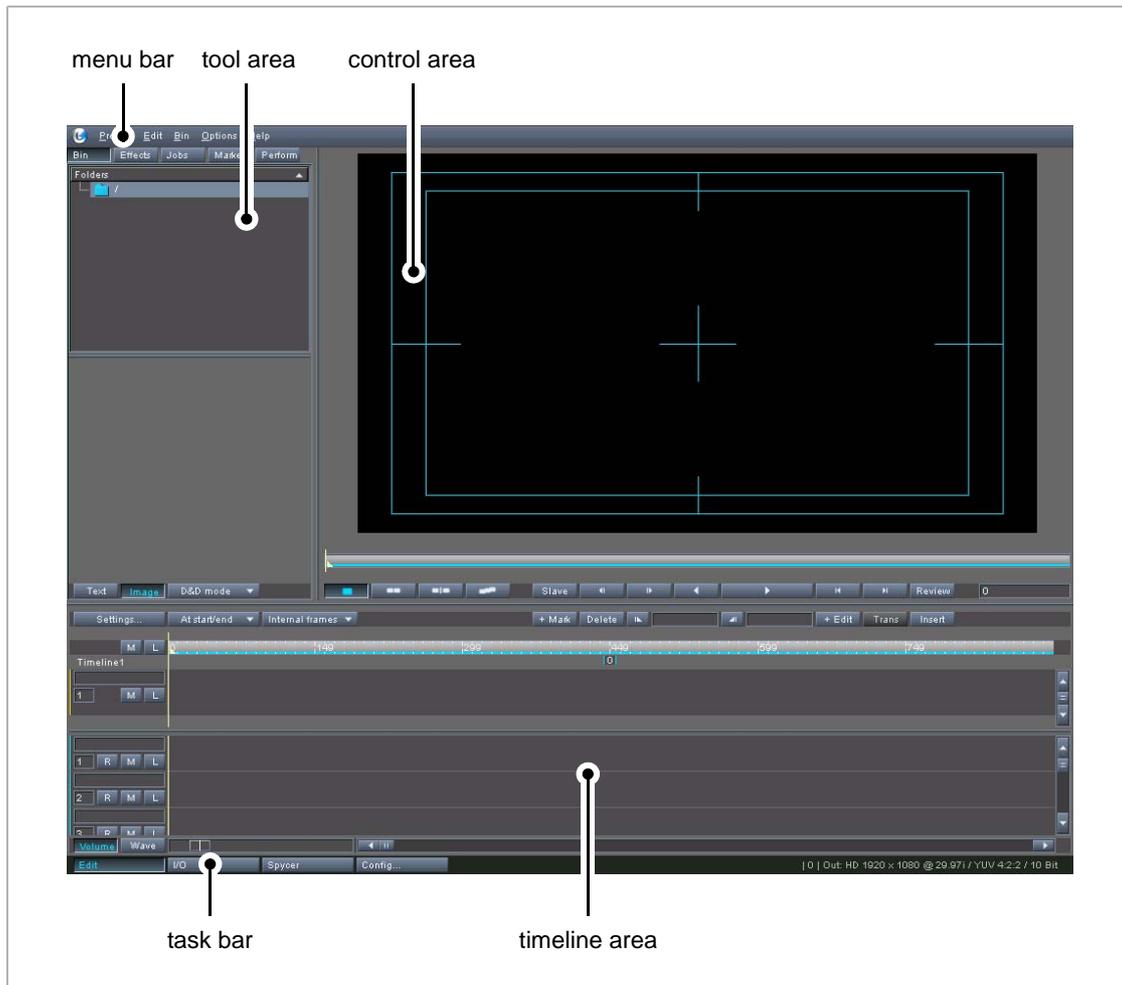
- Overview of the User Interface (page 34)
- Switching between Software Modules (page 37)



## Overview of the User Interface

This section gives an overview of the start-up user interface of the software.

After starting the software, the software module Edit Tool appears first:



Start-up user Interface



<b>menu bar</b>	At the top of the user interface you can find a menu bar. This menu bar provides access to functions and tasks of an administrative nature. Here you can find, for example, import and export functions as well as several menu options generally concerned with projects and project files.
<b>tool area</b>	Directly below the menu bar you can find the tool area which may show you depending on the currently active software module and/or on the optional features available various tools that can be used during your work with the system. The tools are provided as tabs to switch easily between them. By default you can find among the tools, for example, the bin which provides initial access to the video material. For more details about the tool area and the individual tools see chapter "Tool Area" (page 29).
<b>control area</b>	The control area is used to pre- and review your current project. At the top you can find the video overlay where you can see the video material. Below the video overlay a scrub bar of the timeline is available. In contrast to the timeline in the timeline area where you can zoom in and out, the scrub bar always shows the complete timeline of the project. Below the scrub bar the controls are located to play out and move within your current project, see section "Control Area" on page 79



### **timeline area**

In the timeline area you can find the video tracks. Most of the editing tasks are performed here. The timeline area can be configured freely and thus be adapted to your individual needs. This area and how to work with projects in the timeline are explained in chapter "Timeline" (page 61).

### **task bar**

The user interface provides at its bottom a task bar where you can switch between the different software modules of the software. The task bar is available in most modules and you can easily start and switch between them. See also section "Switching between Software Modules" on page 37.

## Switching between Software Modules

The user interface provides at its bottom a task bar where you can switch between the different software modules of the DVS software. The task bar is available in most modules and with it you can easily switch to another module.



Task bar of the user interface

After starting the software the Edit Tool is started automatically. When you click on one of the inactive buttons in the task bar, the respective software module will be loaded, most of them in the upper part of the user interface. The task bar provides the following buttons:

Edit	The Edit button activates the Edit Tool of the DVS software. This software module allows to edit video material with effects to clips in a timeline. It is automatically active after starting the software and described in this user guide.
Spycer	With the button Spycer you can activate the local content management software by R&S DVS where you can browse and/or search for data on local and network storages. Its management tools allow you, for example, to defragment data as well as to define or alter metadata. Additionally, you can preview clips and add them to the bin of the software by a simple drag-and-drop procedure. Spycer is described in the "Spycer" user guide.
Config...	The Config... button opens the Configuration Tool. Here you can configure and set up the whole video system and the software. With it you can, for example, set up the period for the automatic save function of the project file (autosave) as well as more software specific settings, such as the bin properties.



For a more detailed description of all basic software modules as well as other parts of the software together with references to their descriptions, please refer to section "Software Structure" on page 17.



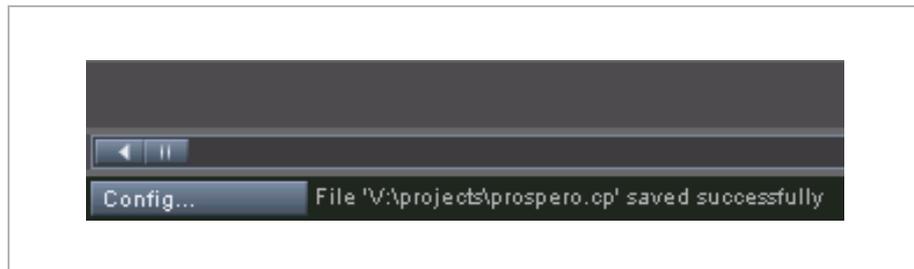
Additionally, you can find at the bottom right of the task bar information about the currently loaded project, the duration of its timeline in total and the set video output format for the timeline:



Currently loaded project

The timeline duration shows you the duration of all clips present in the timeline tracks and depends on the currently selected video output raster (frame rate).

Furthermore, to the right of the task bar you can find some status messages. They will be displayed as soon as project relevant tasks are performed, for instance, when a project is loaded or saved.



Save destination display

Also, this part of the task bar will provide you with help information about the various menu options available via the menu bar of the R&S DVS software. The help information will be displayed when you place the mouse cursor over one of the menu options.



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# Tool Area

This chapter describes the features of the tool area available in the Edit Tool module in detail.

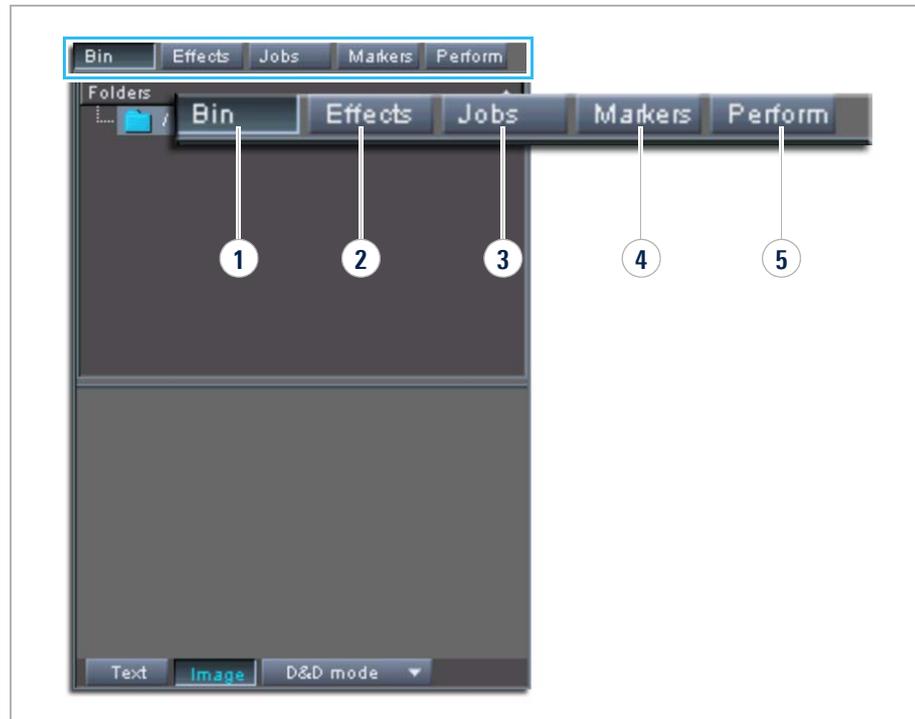
The chapter is divided in the following sections:

- Tool Area Overview (page 40)
- The Bin (page 42)
- Effects (page 61)
- Jobs (page 67)
- Marker Table (page 68)
- Performance Monitor (page 69)



## Tool Area Overview

The Tool Area contains various supportive tools that can be used during work. When you activate one of the inactive tool tabs, the tool area will change its appearance and the respective tool will be displayed.



No.	Item	Description
1	Bin	Provides access to the video/audio material stored on your system, see "The Bin" (page 42).
2	Effects	Provides access to the effects delivered with the R&S DVS software, see "Effects" (page 61).
3	Jobs	Gives information about the status of render operations that have been initialized, see "Jobs" (page 67).



No.	Item	Description
4	Markers	Provides overview of the markers set in the timeline. Markers can be placed at certain positions, e.g. as a reminder to cut the clip, see "Marker Table" (page 68).
5	Perform	Monitors the workload of the system during a realtime operation, see "Performance Monitor" (page 69).

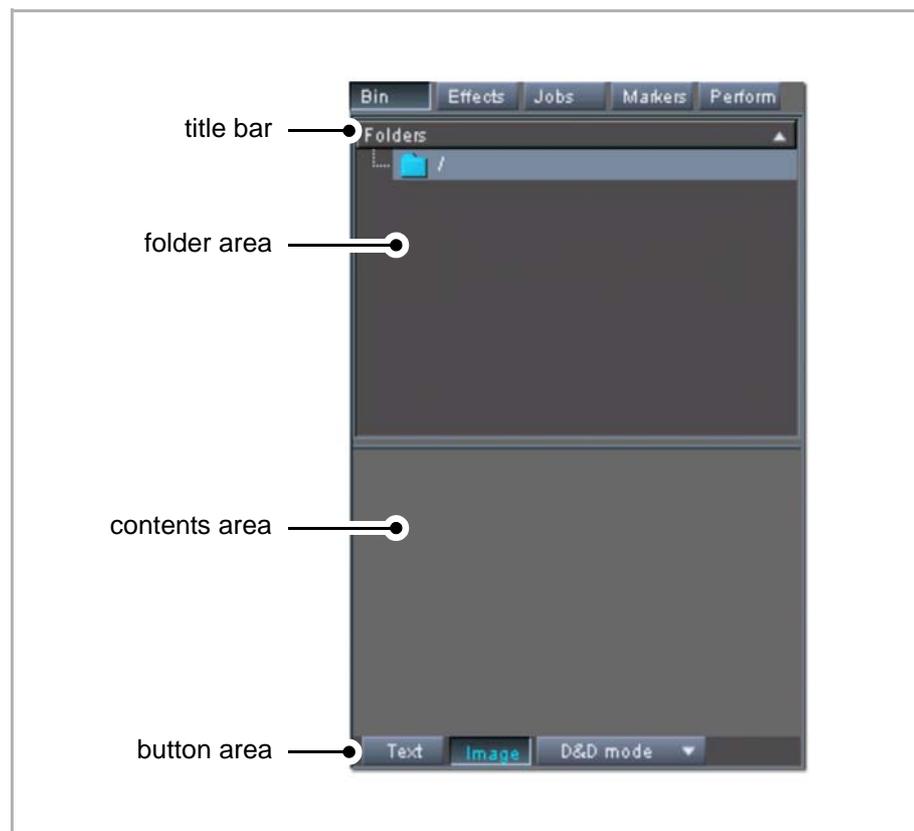
## The Bin

After starting the R&S DVS software the Edit Tool will be started automatically. At the upper left side of the program window you can see the tool area with the bin activated by default.

The following topics are covered:

- Overview of the Bin (page 42)
- Bin Configuration (page 44)
- Adding Clips to the Bin (page 46)
- Details about Clips (page 49)
- Working with Folders in the Bin (page 52)
- Working with Clips in the Bin (page 54)
- Using Proxies (page 58)

### Overview of the Bin



Bin overview



<b>title bar</b>	With the title bar you can change the layout of the bin or sort your created folders present in the folder area.
<b>folder area</b>	In the folder area you can create folders to sort and structure your video and audio material. This way you can perform a clip and project management.
<b>contents area</b>	In the contents area you can see the video or audio material already added to the bin and sorted into the folders via their thumbnails or text information. If the thumbnail view is activated, a scrub bar to preview your material in still images and to set roughly the inpoint of the respective clip is provided by a clip once it is selected. You can administer the clips directly or add new clips to the bin with the help of the context menu of the contents area. Via the context menu of a clip you can also create a proxy from it in case its video format exceeds the realtime capability of the system.
<b>button area</b>	The button area of the bin contains the view buttons that can be used to select whether the clips in the contents area shall be seen as thumbnails with text or with their text information only. Additionally, it contains the drag-and-drop mode settings.

The bin provides initial access to the video/audio material stored on your system. In the bin you can find two main areas: In the folder area you can make folders to sort your material into. This way, you can perform a clip and project management. In the contents area you can preview the material sorted into a folder via thumbnails or text information. The thumbnails also provide a scrub bar to set roughly the inpoint of the respective clip.

You can configure the appearance of the bin freely. It will be saved together with the project file:

- You can arrange the areas horizontally if you like (select the respective appearance from the context menu of the bin's title bar).

- Via the buttons in the button area you can set whether the clips shall be seen as thumbnails with text or with their text information only.
- The kind of text information displayed in the bin can be set freely with the Configuration Tool (button **Config...** or **Options » Configuration project...**).

Furthermore, the right edge of the tool area can be moved, for example, to display the contents of the activated tool completely. Then, in case of the bin, you will be able to view the thumbnails together with all text information available. If you pull the right edge of the tool area completely to the left, the tool area will no longer be visible; if you pull it completely to the right, the control area will be hidden and the contents of the activated tool will be displayed in full.

## Bin Configuration

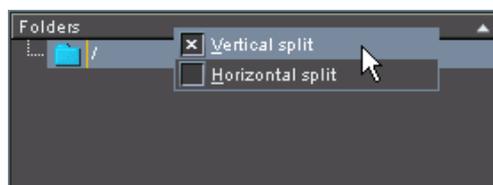
With the bin you can perform a clip and project management: You can structure the clips by sorting them to different folders and you can preview the clips as well as access additional information via their text display in the bin. To serve all these functions at once, you can change and configure the layout of the bin freely.

### Changing the Layout of the Bin

To provide, for example, for a better view on the material in the bin, the areas of the bin, the folder and the contents area, can be arranged horizontally or vertically via the title bar of the folder area.

Perform the following steps:

1. Call up the context menu of the bin's title bar (usually with a right-click of the mouse).



2. Select the horizontal or vertical appearance of the bin from the context.



The context menu to change the layout of the bin can also be called on the area where the view buttons are located.



Additionally, you may change the size of the tool area to get a better view on the bin or to make items visible that cannot be seen in the visible part of the tool area.

The layout of the bin will be set accordingly.

### Changing the View of Clips

Via the view buttons at the bottom of the bin you can set whether the clips in the contents area shall be seen as thumbnails with text or with their text information only.

Use the button **Text** to view the clips in the contents area with their text information only:



Bin clip name ▲	Resolution	Color depth	Color ▲
American_Beauty_Par1	1920 × 1080	12 bits	RGB (
American_Beauty_Par1	1920 × 1080	12 bits	RGB (
berlin_	1920 × 1035	10 bits	RGB (
Downtown_LA_Part03_	2048 × 1556	10 bits	RGB (
DVS 000_	1920 × 1080	8 bits	YUV (
Hollywood.	1920 × 1080	8 bits	YUV (
Logo_	1920 × 1080	8 bits	YUV (
Staples_Ufo_Night_	1920 × 1080	12 bits	RGB (

In this view you can easily alter the sequence of the columns to your requirements by dragging and dropping the column headings with the mouse.

Additionally, you can sort the clips in ascending or descending order by clicking on a column heading. The sorting will also be available after switching to the thumbnail view of the bin again.

With the button **Image** you can activate the view of the thumbnails again.



For the thumbnail view of the contents area there are also text information available that can be set via the Configuration Tool. These texts will then appear to the right of the thumbnail.



## Adding Clips to the Bin

To prepare the bin for a project, you have to fill it with video material first. There are several ways to do this: The best and most informative way is to use Spycer, but they can also be added by using a file manager, which is more appropriate when using the Edit Tool for the first time.



The R&S DVS software works with standard computer files. Video and audio data should be stored on the designated storage only (e.g. the system's main storage or a DVS-SAN). Other storage locations may be too slow for realtime operations. Furthermore, it is strongly recommended to use the main storage for video and audio as well as project related data only. Save other data on the system disks.

Perform the following steps:

### NOTICE

#### Missing File Header Information

When adding clips to the bin with a procedure other than a record, some properties may not be discerned properly due to missing file header information. Then they will either be deduced from the file format, color space, etc. of the clip, or configured to the currently set timeline output settings.

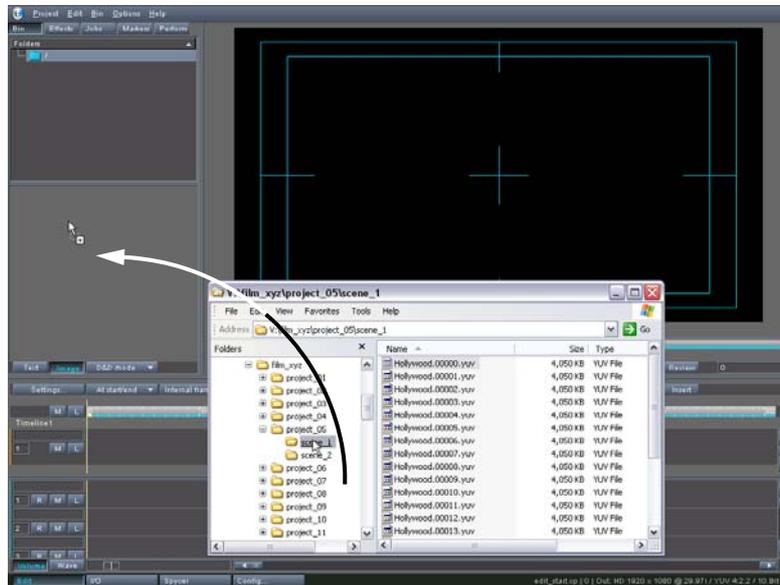
**If the properties of the clip do not match the material on the storage, you have to change them accordingly.**



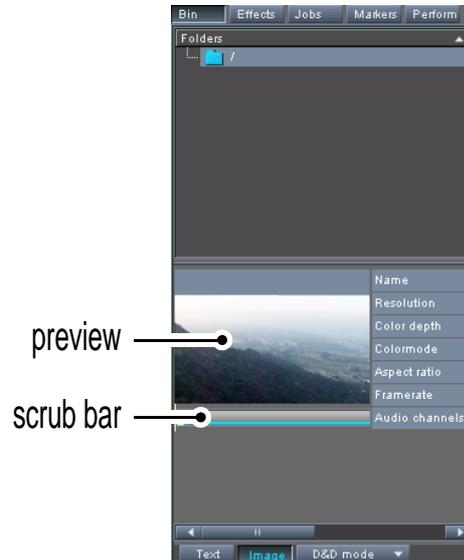
By default, when still image clips are added to the bin, they will not be checked for consistency, meaning that missing frames in an image sequence may go unnoticed. With the setting Clip splitting on gap detection of the Configuration Tool (group Bin on the tab Project or Defaults) clips added to the bin will be split at their gaps if such are detected in the numbering.

1. Open a Windows file manager, for example, the Windows Explorer with the keyboard combination **[Windows + E]**.
2. In the file manager select a video file (either a file within a directory or the directory itself) on the storage where the video data is stored.

3. Drag and drop the selected video file/directory to the contents area of the bin with the mouse:



- ▶ The respective video data will then be made available to the software and you will receive a thumbnail of the material in the contents area of the bin. When the thumbnail is selected, it provides the following features:





4. Add another, different clip to the bin by performing the drag-and-drop procedure again.
  - ▶ The new clip is added to the clip list of the bin as well. Now two clips are available in the Edit Tool and you can start working with them. With the scrub bar below the thumbnails (visible when a clip is selected) you can preview the material and roughly select an inpoint for the respective clip.



If you select another file than the first frame file in a video directory, the scrub bar cursor of the thumbnail (the clip's inpoint) will be set accordingly.

You may select more than one video directory in the file manager and drag them to the contents area of the bin. The respective clips will all be added to the bin.



Further options to add a clip:

- by using the menu option **Add clip...** on the context menu of the contents area or the menu **Project > Add clip...**
- by using Spycer - the integrated content manager.
- via capturing - video recording with the I/O Tool of the R&S DVS

Clips have been added to the bin.

## Details about Clips

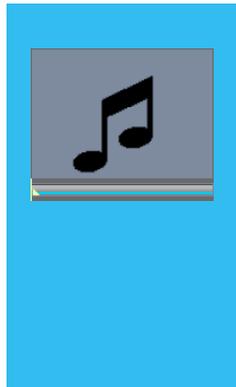
During the adding of clips to the bin, the clips are checked for their type, length, resolution, bit depth, etc. If set accordingly, the text information of the clips in the bin will show you these information about the clips. This section provides some details about clips in the R&S DVS software.

### Clip Types



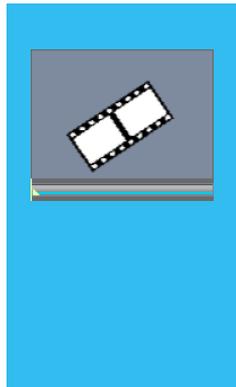
#### Video clips

Video clips are seen in the contents area of the bin usually with their thumbnail previews. When a clip is selected, a scrub bar below the thumbnail will be available that can be used to preview the clip in still images and select an inpoint of the clip roughly (if enabled via the Configuration Tool).



#### Audio clips

To use audio in the Edit Tool, you have to add the audio files to the bin. The R&S DVS software supports audio clips that contain more than one mono or stereo channel (multiple channels) in the audio file. These clips will be available as one clip in the bin, but when added to the timeline, the additional channels will be added to the other audio tracks below the selected one.



#### Invalid clips

This icon indicates a video clip whose data is currently not available or an invalid clip. Then wait a few seconds and give the software time to gather the data. If after that the icon is still visible, you have to either set the properties of this clip correctly via its context menu or use the menu option Clip relink on the Bin menu to link it to the correct video material on the storage.

### Multi-clips

Multi-clips are clips of either video or audio that are present in the bin as one clip but consist of several individual clips on the storage. Usually, these individual clips are stored in a subdirectory each, and all subdirectories are located under one main directory. When adding a multi-clip to the bin via a drag-and-drop procedure from a file manager you may select the main directory as a clip and add it to the bin. All individual clips will then be available as one clip in the bin. Even when dragged to the timeline, the multi-clip is handled as one clip.

Multi-clips are a necessity due to file system limitations of the operating system, meaning Windows may cause problems if more than 20,000 files are stored in one directory. However, the R&S DVS software will create multi-clips automatically, for example, during the finalizing of a project or when recording a clip with the I/O Tool. Then, when the clip exceeds a configurable number of frames in one directory, the software divides the clip and saves it in as many subdirectories as needed under one main directory. Afterwards this main directory can be added to the bin as a multi-clip. To recognize multi-clips correctly, a meta-data file (**SequenceInfo.xml**) is created as well, detailing the number of files per folder for this clip.

### Pending clips



Clips of either audio or video that were not completely recorded, receive this icon. Then you will know that parts of this clip may be missing. However, you can already use them in the timeline of the Edit Tool and work with them.

### Unknown



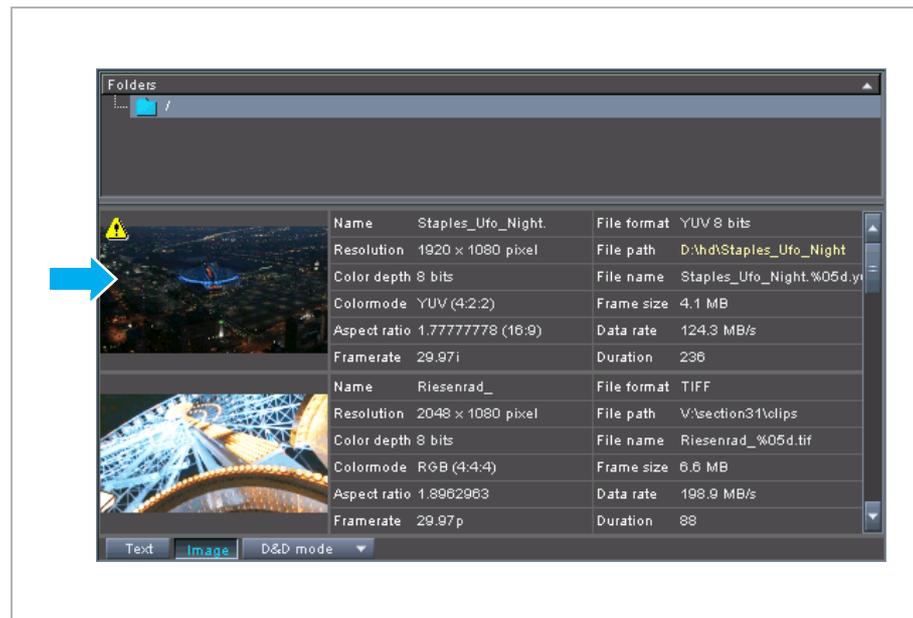
Files of an unknown type, i.e. files where the DVS software is not able to determine whether they are audio or video files, will get this icon. They cannot be used in the software.

## Real Time Capability of Clips

With an optimized system and a main storage that incorporates fully functioning disks, the R&S DVS system can handle film material up to 4K in realtime. If you want to process material of, for example, a higher resolution the realtime capability of the system cannot be ensured.

The realtime capability of the system depends on various factors, such as image size (resolution), codec, bit rate, frame rate, location of the clip on the storage, etc. When adding a clip to the bin, it will be checked whether its location and/or file format are realtime capable.

Clips that may cause trouble because of their location and/or file format invoke a warning message when added to the bin. Then the clip will be visibly marked in the contents area of the bin: In the thumbnail view a warning icon will be displayed on the thumbnail and the respective text information that is the cause for this warning will be colored in yellow:



In the figure above the top clip is stored on a system drive. Because this location is not realtime capable (it may not provide enough data transfer rate to make the vast amount of data accessible in time), a warning icon is visible at the top left side of the thumbnail and the respective value of the text information that is the cause for this warning is marked in yellow.



## Working with Folders in the Bin

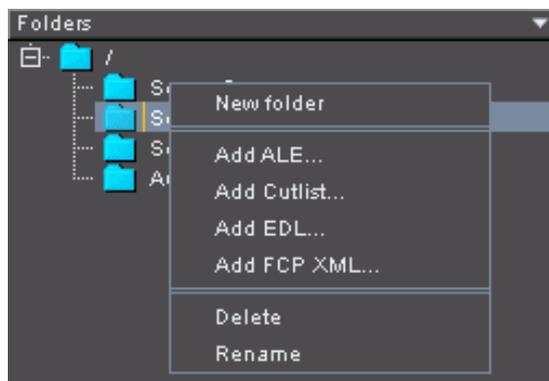
The folder area of the bin is used to create folders to sort and structure your video and audio material by sorting them to different folders. This way you can perform a clip and project management. In this section you can read what to do to create folders and how to administrate them.

### Creating Folders

Via the context menu you can create a new folder manually in the folder area of the bin.

Perform the following steps:

1. Call up the context menu on a folder in the folder area of the bin and select the menu option **New folder**.



- ▶ This will create a new folder in the folder area. It will be placed as a subfolder below the selected folder where the context menu was invoked.
2. Enter the name of the folder via the keyboard and confirm it with the **[Enter]** key.
  - ▶ Then the new folder will be present in the folder area of the bin and you can use it to sort your audio and/or video material into it.



Folders can also be created automatically with a drag-and-drop procedure from a file manager.

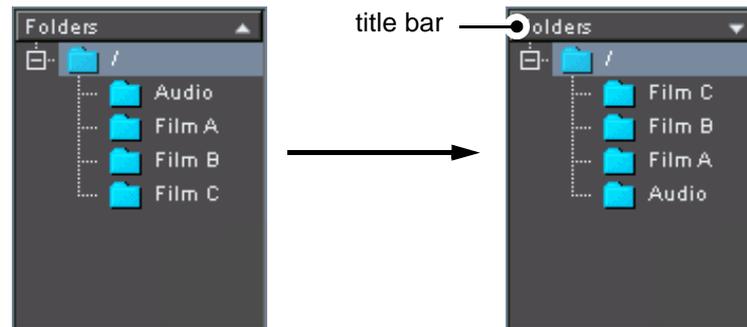
New folders have been created.

## Sorting Folders

As soon as folders are available in the folder area of the bin, you can sort them in descending or ascending order. If your project contains a lot of folders in the bin, this will make it easier for you to find an individual folder.

Perform the following steps:

- Simply click on the title bar with the mouse.



This switches between a descending and ascending order of the folders in the folder area. The type of order will be indicated by the triangle at the right-hand side of the title bar.

## Renaming Folders

You can rename folders and thus give them a different name after they were created in the folder area of the bin.

Perform the following steps:

1. Call up the context menu on a previously created folder in the folder area of the bin and select the menu option **Rename**.
2. Enter the new name of the folder via the keyboard and confirm it with the **[Enter]** key.



Only folders created previously can be renamed. The root folder cannot be changed in any respect.

The folder has been renamed.

## Deleting Folders

Perform the following steps:

1. Call up the context menu on a previously created folder in the folder area of the bin and select the menu or click **[Del]** on the keyboard.
  - ▶ A warning message appears on the screen.
2. Confirm the message.



Only folders created previously can be deleted. The root folder cannot be changed in any respect.

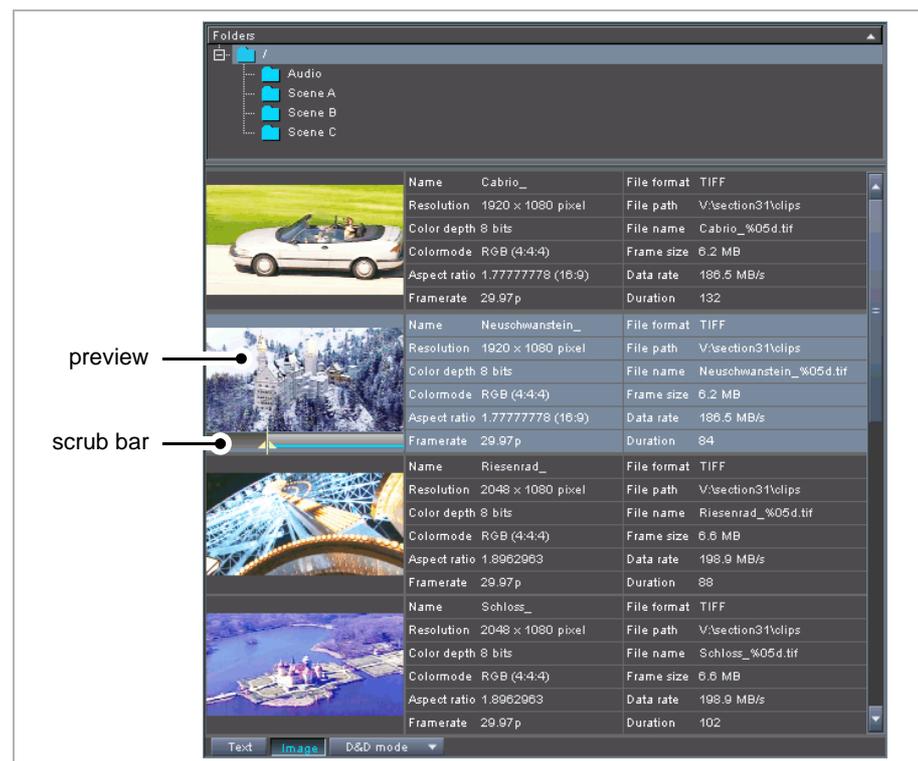
The folder has been deleted.

## Working with Clips in the Bin

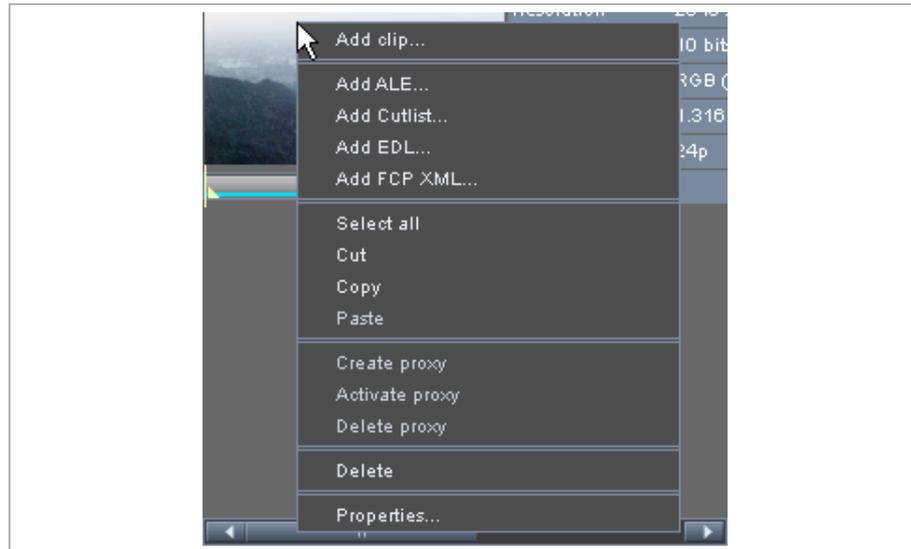
This section describes the administration of clips.

### Overview

In the contents area of the bin you can see the video material already added to the bin and sorted into the folders via their thumbnails and/or text information. If the thumbnail view is activated and a clip is selected in the contents area, a scrub bar to preview your material in still images and set roughly to the inpoint of the respective clip is provided by each thumbnail.



For some of these tasks the context menu of the clips in the contents area is used. It provides different clip related functions, such as the adding of a new clip to the contents area of the bin or altering its properties.



Context menu of a clip in the bin

### Cutting, Copying or Pasting Clips

Bin clips and timeline elements can be cut or copied to the clipboard of the operating system and afterwards pasted again at the location of your choice, either in the contents area of the bin or on a timeline track. The elements in the clipboard can also be pasted into a new project.

With this you can copy or move the selected element(s) within the bin (e.g. from folder to folder), within the timeline (e.g. between tracks or within one track), between the bin and the timeline tracks, or vice versa. Elements such as clips pasted into the timeline will be added at the current position of the timeline cursor. Furthermore, to paste clips to different timeline tracks rather than the first track, you have to lock the lower track numbers where the pasting should not occur.



When operating between bin and timeline or vice versa, the selected clip(s) will be added (i.e. copied).

For these procedures the focus must be set correctly. For example, when operating in the bin, its contents area (not the folder area) must have the focus.

The cut, copy and paste operations can be initialized either via the context menu of the selected element(s) or via the usual keyboard shortcuts. Clips within the bin can also be copied or pasted between folders via a drag-and-drop procedure.



**Sorting Clips** When the text information view is selected for the clips in the contents area of the bin you can easily sort the clips:

Perform the following steps:

1. In the text information table simply click on the respective column heading to sort the entries under this column in ascending or descending order.
  - ▶ The clips will be sorted accordingly and the type of order will be indicated by the triangle to the right of the column heading. The sorting will also be available after switching to the thumbnail view of the bin again.



The already sorted clips can even be sorted further, i.e. they can be sorted by up to three criteria in total. With this you are able, for instance, to sort clips by their names as well as by their duration:

2. To sort the list further, hold the **[Ctrl]** key pressed while clicking with the mouse on another column heading.

Whether this sorting occurs in ascending or descending order is determined by the sorting order of the very first column heading, i.e. if the first selected column is sorted in descending order, all following sorting criteria will also be sorted in descending order. By repeating the last step you can sort the list of clips by up to three criteria, and the whole sorting will also be available when switching to the thumbnail view of the bin.

**Sorting Clips into Folders** As soon as clips are present in the bin you can sort them into previously created folders to keep your project file in order and thus to perform a clip and project management.

Perform the following steps:

- Simply select the clips in the contents area of the bin and drag and drop them to the respective folder in the folder area.



If you drag and drop the clips while the **[Ctrl]** key is pressed, the clips will be copied instead of moved.

Clips are present now in this folder and you can view them again in the contents area when the folder is selected from the folder.

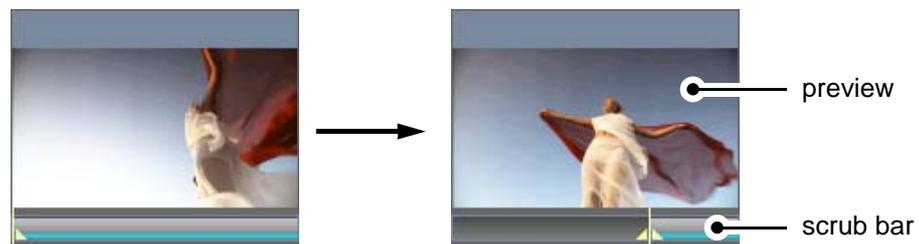
## Preparing Clips for Editing

To begin an editing process, you have to use the clips of the bin and drag and drop them to the timeline of the CLIPSTER.

If a clip is selected in the contents area of the bin when in thumbnail view, you can use the scrub bar below the thumbnail to preview the material and roughly select an inpoint for the respective clip.

Perform the following steps:

1. Move the scrub bar cursor to the left or right to preview your material and/or to select an inpoint:



While adding a clip to the bin, you can already set the position of the scrub bar cursor and thus define a possible inpoint for the clip. While adding clips (see section “Adding Clips to the Bin” on page 46) select the particular frame file where the inpoint should be set and add it to the bin. The scrub bar cursor of the thumbnail will be set accordingly.

2. After that simply select the clip and drag it to a video or audio track of the timeline to start your editing work.

The Edit Tool will use the selected inpoint as the starting point of your clip if this feature is enabled. However, if you drag a video clip from the bin to the control area of the Edit Tool, the software switches to the source-edit mode where you can select the in- and outpoint of the clip frame accurately, see “Source-Edit Mode” (page 98). From there you can add it with adjusted in- and outpoint either to the timeline or back to the bin again to receive a copy of this clip with adjusted in- and outpoint in the bin.



## Using Proxies

This section describes how to administrate proxies in the DVS software.

A proxy can be used when working with high-resolution film material (greater than 4K). It is a downscaled clip of the high-resolution data that will be internally used by the Edit Tool as a substitute for its original material to ensure a realtime working environment.

### Creating Proxies

Once a proxy has been created, it will be available in the bin instead of the original material. Nevertheless, the bin clip and all its representations in the timeline are still linked to the original material and by turning the proxies on or off you can decide whether the material of the high resolution is used in the Edit Tool or the proxy. Thus you can work with the downconverted clips as usual in the timeline but when playing out or finalizing you can switch back to the original material in high resolution.

For each clip available in the bin that may exceed the realtime capability of the system you can create a proxy to ensure a realtime capable environment. This means, when the resolution of the clip is greater than 2K, you can create proxies via its context menu in the bin.



If the clip's resolution does not exceed the realtime capability of the system, the respective menu options to administrate proxies will not be available.

Perform the following steps:

1. Select the clips that you want to create proxies of from the bin.
2. Call up the context menu on one of the selected clips and activate the menu option **Create proxy** or use the menu option **Generate proxies** on the Bin menu.
  - ▶ This switches the tool area from the Bin to the Jobs tab which will then detail the status of the render operation(s). During the rendering the downconverted images of the proxy will be stored in a reserved location for proxies on the main storage.
3. Save your project file.



If an already saved project file is not saved again after creating proxies, the proxy files will not be recognized by the Edit Tool when loaded once more: Neither will they be used for the project nor can they be deleted via the software. They have to be deleted manually then.

A proxy has been generated.

### Activating or Deactivating Proxies

When a proxy is activated, the bin clip and all its representations in the timeline will show the downconverted material; when it is deactivated, the original high-resolution material is used in the Edit Tool.

Perform the following steps:

1. In the contents area of the bin select the clips that provide a proxy.
2. Call up the context menu on one of the selected clips and choose the menu option **Activate proxy**.
  - ▶ If this menu option shows a cross in front after it was clicked, the proxies are activated and will be used for the selected clips. The selected bin clips are now configured to the proxies as their source and the properties of the clips will detail this accordingly.
  - ▶ In case the menu option does not show the cross in front, the proxies of the selected clips are deactivated. Then the original materials will be used for the respective bin clips and their representations in the timeline. The properties of the clips will detail this accordingly.



You can also use the menu options **Activate all proxies** or **Deactivate all proxies** on the Bin menu to activate or deactivate all proxies in the bin in one step.

Proxies are activated/deactivated.

### Deleting Proxies

Perform the following steps:

1. In the contents area of the bin select the clips whose proxies you want to delete.
2. Call up the context menu on one of the selected clips and choose the menu option **Delete proxy**.



In case you want to delete all proxies available for the current project in a single step, you can use the menu option **Delete all proxies** on the Bin menu.

The proxies of the selected clips will be deleted immediately from the storage and, if applicable, the bin clips will be configured back to their original source.

## Effects

This section explains how to administer the effects available in the effects pane, i.e. how to create and apply preset effects.

The following topics are covered:

- Effects Tab Overview (page 61)
- Adding Effects to the Timeline (page 62)
- Creating Preset Effects (page 62)
- Using Preset Effects (page 64)
- Administration of Preset Effects (page 65)

### Effects Tab Overview

The Effects tab of the tool area provides access to the effects delivered with the software.



Effects pane

The effects pane offers you the available effects operators in a tree structure. The individual effects operators provide you with additional editing features for your video processing tasks. However, they may be part of optional packages.



Further information about effects in general as well as individual effects operators and their controls can be found in chapter "Timeline Element Properties".

## Adding Effects to the Timeline

The effects operators available in the effects pane can be applied to clips in the timeline. You simply have to add them to the effects list of the respective clip which is a part of its timeline element properties.



You can call up the properties of a timeline element with a double-click on the respective element in the timeline, or by selecting the menu option **Show » Effect properties** on the element's context menu. Further information can be found in "Accessing the Timeline Element Properties" (page 211).

Once at least one video clip is available in the timeline, it can receive an effect from the effects pane of the tool area.

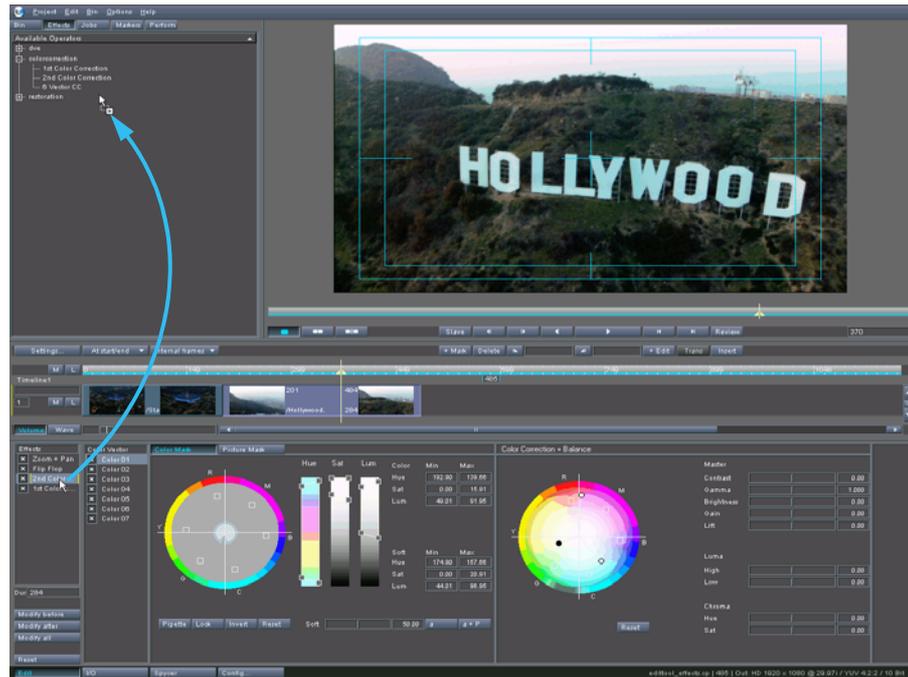
## Creating Preset Effects

To apply the same effect settings of one clip to another, the adjusted effect's settings in the timeline element properties must be created as an independent effect.

Perform the following steps:

1. If not already available in the timeline element properties, apply the respective effect to a clip in the timeline as described in section "Adding Effects".
2. Adjust the settings of this effect according to your needs in the settings pane of the timeline element properties.
  - ▶ All changes to the effects operator are immediately applied to the selected clip in the timeline.
3. Activate the Effects tab in the tool area of the Edit Tool.

4. Take the adjusted effect from the effects list of the timeline element properties and:
  - ▶ drag and drop it back to the effects pane in the tool area or
  - ▶ press the key combination **[Shift + F<n>]**, with <n> as the number of the function key on your keyboard that you want to assign the preset effect to (i.e. keys [F1] to [F12]).



- ▶ This will create a 'subeffect' under the respective effects operator in the effects pane. It will carry in its name the function key written in square brackets as the last element. By performing the above repeatedly you can create as many preset effects for this effects operator as there are function keys available.



The assigned function keys are valid for the selected effects operator alone, meaning you can assign the same function key(s) to different effects operators. For example, you can assign the [F2] key to a primary color correction as well as to a zoom-and-pan effect, each providing the correct effect settings for this respective effects operator when applied to a clip.

The assignment of function keys for preset effects can also be adjusted manually: The function key has to be stated last in the name of the preset effect in square brackets to enable it as a keyboard shortcut for a preset effect. For example, by changing a preset effect name to **<name string> [F2]** you will assign the function key [F2] to it..

An effect is now preset. Once available in the effects pane, the name of the preset effect can be changed.

## Using Preset Effects

Once preset effects are available in the effects pane of the Edit Tool, they can be applied to clips in the timeline.



Effect settings can also be transferred to other clips in the timeline with the help of the timeline element properties area, see also "General Items of the Properties Area" (page 211).

To apply preset effects, drag and drop it to the effects list of a clip's timeline element properties.

You can also use the preset effects to alter settings of an effects operator already applied to a clip:

- 1 Select the effects operator from the effects list of the timeline element properties so that its settings are visible in the settings pane to the right.
- 2 Drag and drop the preset effect into the settings pane.



In case the preset effect has been assigned a keyboard shortcut you may also press the function key of the respective preset effect to apply it.

By pressing an unassigned function key you can call up a list of all available preset effects for this effects operator. Then you can use it to select one of the preset effects and apply it.

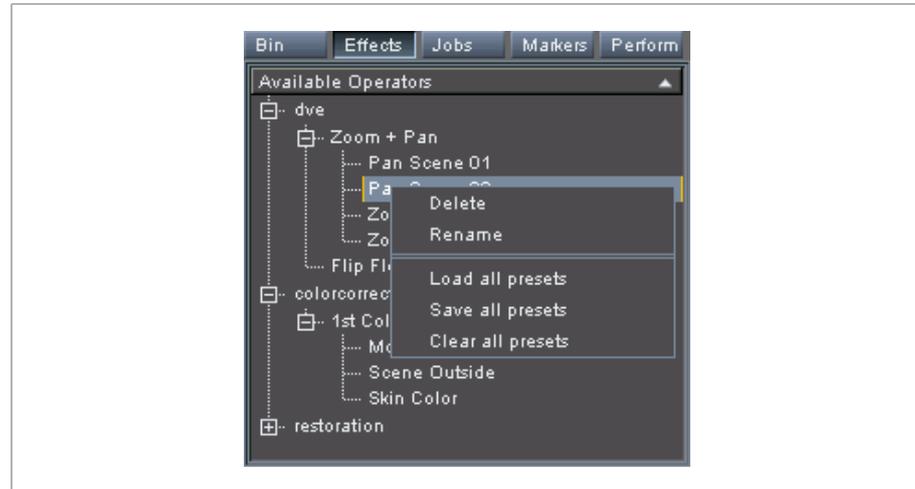
The predefined settings of the preset effect will be set for the already applied effects operator.



The settings will only be adjusted if the preset effect is of the same type as the effect selected from the effects list of the timeline element properties.

## Administration of Preset Effects

To facilitate your work with preset effects, they can be administered in several ways. For this, use the context menu of an effect in the effects pane.



The contents of the effects pane, i.e. all preset effects can be saved to an XML file via the **Save all presets** menu option. You can even build up a library of different effects settings that can be reloaded later and thereby added to any project you want.



Preset effects can be loaded from various sources. You can use a specially created preset effects file, a standard project file or its derivatives (autosave or backup files).



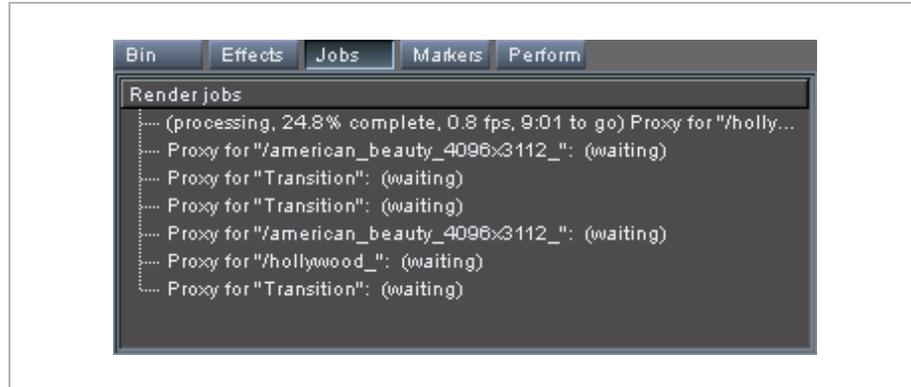
**Possible sources for preset effects**

<b>File extensions</b>		
	<b>*.xml</b>	Effects file
	<b>*.cp</b>	Project file
	<b>*.cp.autosave</b>	Automatically saved intermediate situation
	<b>*.backup.cp</b>	Backup file of old project file

Also, you can sort effects in descending and ascending order.

## Jobs

The Jobs tab details information about the status of render operations that have been initialized in the software.



Whenever possible, the render jobs will be performed in the background of the system, i.e. during their creation you can continue to work in the timeline of the Edit Tool as usual. In case of several render jobs, they will be processed one at a time in the order indicated. Once the render operations are finished, their entries will disappear from the list of the **Jobs** tab.

The corresponding clip and processed image will be displayed in the video overlay when selecting from the list the job that is currently under processing.

When entries are displayed in the list on the tab **Jobs**, you can cancel the respective job and thus delete its created files. For this call up the context menu on the job entry that you want to abort.

<b>Delete</b>	Cancels the selected render job where the context menu was called and deletes already rendered files.
<b>Delete all</b>	Cancels all render jobs listed on the tab Jobs in a single step. Already rendered files will be deleted as well.



## Marker Table

In the timeline of the Edit Tool you can place markers at certain positions, e.g. as a reminder to cut the clip at this position at a later stage or to use specific DCI or IMF markers. These markers can be placed either manually in the timeline of the Edit Tool or automatically.

Once markers are positioned in the timeline, the tab Markers of the tool area provides further information about them. It presents list of all timeline markers that are currently available in the timeline. The individual entries show the positions of the markers in the timeline.

#	Action In	Action Out	Action Out	Name	Label	Comment	Thumbnail
1	00:00	08:10	08:10	First Frame of Bars and Tone	FFBT		
2	08:10	20:19	12:09	My Timeline Marker	Clipster Timeline	dropped	
3	20:19	20:20	00:01	Last Frame of Bars and Tone	LFBT		
4	20:20	31:05	10:09	First Frame of Composition	FFOC		
5	31:05	31:06	00:01	Last Frame of Composition	LFHS		

Marker table



For more information about markers, see "Markers in the Timeline" (page 167)



## Performance Monitor

With the performance monitor of the software you can monitor the workload of the system during a realtime operation. Thus you can verify, among others, the status of the hard disks as well as of certain files.

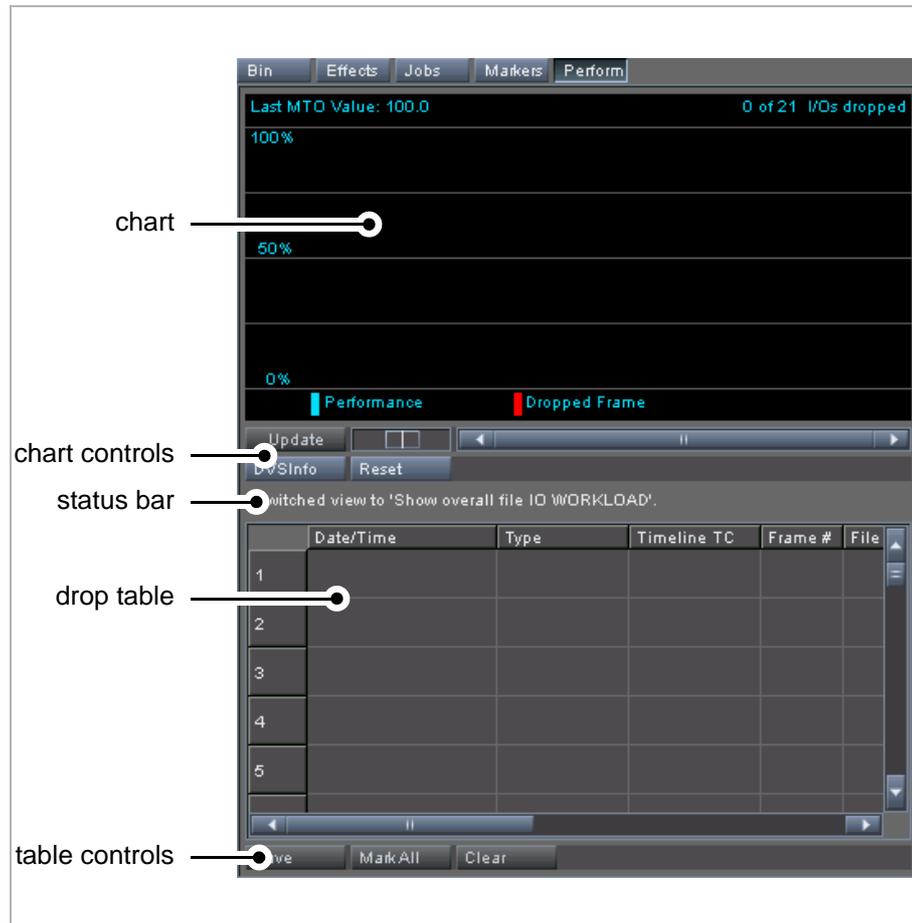
The following topics are covered:

- Monitor Overview (page 69)
- The Chart (page 72)
- Chart Controls (page 74)
- The Drop Table (page 76)
- Table Controls (page 77)

### Monitor Overview

After starting the software, the bin is activated by default in the tool area. As soon as you select the tab **Perform**, the performance monitor will appear.

The performance monitor provides you with detailed information about dropped frames (frames that the system could not load or write in time during a realtime operation):



<b>chart</b>	The chart offers you a graphical interpretation of the measured workload of the system. During a playout or record operation the processing workload will be shown via bars in the chart.
<b>chart controls</b>	With the chart controls you can manage the appearance of the results in the chart or create a proprietary DVS information file.
<b>status bar</b>	Right below the chart controls you can find a status bar which will provide you with status messages about the operation of the performance monitor.

**drop table**

As soon as drops occur during a real-time operation, entries will appear in the drop table, one for each drop that could be detected. The entries provide information, for example, about the date and time when the drop occurred or about the file that was the cause for this drop.

**table controls**

Via the table controls you can either save the results shown in the drop table to a file or set markers in the timeline of the CLIPSTER where the respective drop took place.



Drops are reported by the realtime core of the R&S DVS software. In some cases it may not be able to provide information about the file name and/or path.

Only the last ten reports will be stored.

As soon as the software is started, the performance monitor will write by default a drop report into the subdirectory `drop_reports` under the directory `log` in the application data path of the current user (`%APPDATA%\DVS\Clipster`, for the actual location type in at a **command line echo %APPDATA%**, then press **[Enter]**). There will be one report written per session. However, it will inform you about drops that occurred during this session only when the performance monitor is enabled. Then the report contains information about, for example, the date and time when the drop occurred or about the file that was the cause for this drop. If the performance monitor is disabled, the log file will be written but provide no information about drops that occurred.



Individual frames missing in an image sequence (clip), i.e. image files that are not present on the storage at all, are not registered as drops. You can check the consistency of your material added to the bin with the menu option **Check Bin** on the **Bin** menu.

You can retrieve the location of files where drops occurred also by setting timeline markers with the help of the drop table or its controls.



## The Chart

The chart of the performance monitor provides a graphical representation of the measured performance of the system. During playout or record operations the performance will be displayed via bars in the chart.

### Measurement Modes



The R&S DVS software can operate in two different I/O modes: It can process several image files simultaneously (multi-threaded I/O mode) or one file at a time (single-threaded I/O mode).

Although the multi-threaded I/O mode is recommended for the software because it is more flexible and faster, it can be set to a single-threaded I/O mode via a setting available in the Configuration Tool.

The performance monitor can be switched between two measurements for the system performance:

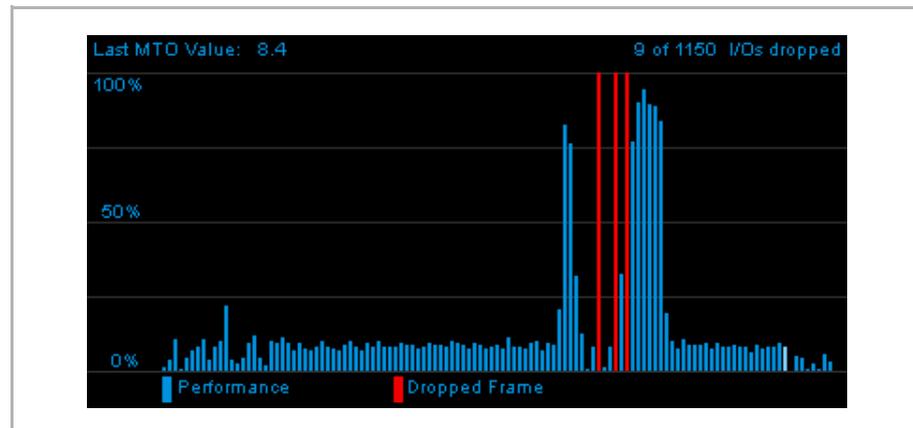
- Overall file I/O workload:  
With this setting the performance monitor measures the overall workload of the system that occurred during a timed interval.
- Individual file I/O duration:  
This measurement is especially useful when operating in a single-threaded I/O mode. Then the performance monitor displays the access times of single files.



Missing frames on the storage are not registered by the performance monitor as drops.

### The Chart in 'Overall File I/O Workload'

If the performance monitor is set to the 'overall file I/O workload' setting, the chart indicates the overall workload of the system during a timed interval (40 ms).



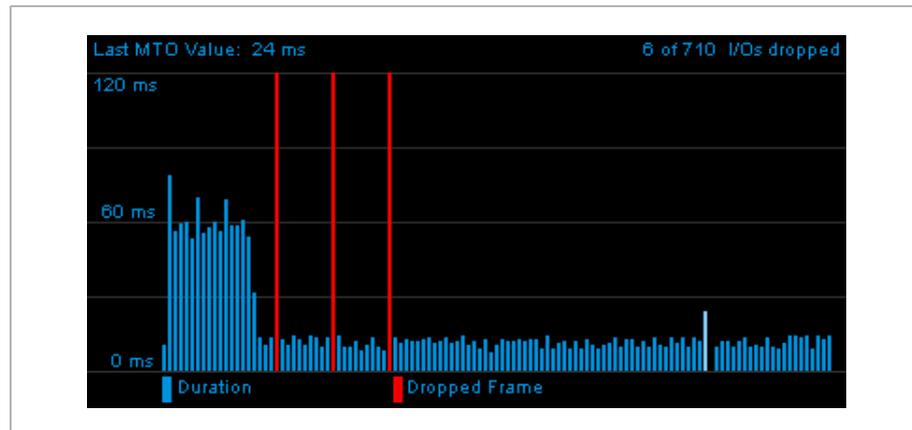
With this setting you can find at the top left of the chart the value of the last multi-threaded operation. It details in certain intervals during operation the workload of all threads in percent, i.e. the value of one bar in the chart.

At the top right of the chart you can find an indication about how many frames were processed total and how many drops occurred during this time.

When operating, the system's workload is displayed via blue bars in the chart. The bars may well reach the 100% line during an operation which does not necessarily mean that a drop may occur soon. It simply shows that all threads of the software were processing continuously at that point of time and that no thread was idle. Drops exceed the workload of the system shown in the chart. They are displayed as bars in red that are cut at the top.

### The Chart in 'Individual File I/O Duration'

If the performance monitor is set to the 'individual file I/O duration' setting, the chart of the performance monitor shows the access times of single files, which is especially useful when the system is operating in the single-threaded I/O mode. If used in the multi-threaded I/O mode, the drawn access times to a single file (one bar) may be longer because several files were read/written at the same time.



At the top left of the chart you can find the last measured access time. It details in certain intervals during operation the measured access time in milliseconds, i.e. the value of one bar in the chart.

At the top right of the chart you can find an indication about how many frames were processed total and how many drops occurred during this time.

When operating, the access times are displayed via blue bars in the chart. If bars reach the top line during an operation, it may indicate difficulties during the loading of particular files. However, clips of a higher resolution usually require more time to access, especially when transitions are applied to the timeline. Then, high bars do not necessarily mean that a drop may occur soon. Drops are detected by the realtime core of the system and they will be displayed as bars in red that are cut at the top.

### Chart Controls

With the chart controls you can control the appearance of the chart or create a proprietary R&S DVS information file.



If the controls appear dimmed, the performance monitor is disabled. To use it, you have to first enable it in the Configuration Tool.





<b>Update button</b>	When viewing the history of the workload in the chart with the history slider (see below) you can return at any time to the current status of the performance monitor where the chart is continuously updated in real time with this button.
<b>Slider</b>	The slider determines the viewing resolution of the chart. When pulled to the left, you will receive a higher resolution: The bars displayed in the chart will get thinner and more bars will be displayed in the chart. When pulled to the right, the bars will get thicker and fewer bars will be visible.
<b>DVSInfo button</b>	<p>In case of problems with your system you may get asked by the service department to create and generate log files. Then you may use the button DVSInfo to store the most important information in one file (in ASCII format). The file name of the log file will be <b>requested_dvsinfo_&lt;system time&gt;.txt</b>, with the <b>&lt;system time&gt;</b> added in the format <b>yyyy-mm-dd_hh-mm-ss</b>. It will be stored in the subfolder dvsinfo in the log directory in the application data path of the current user (<b>%APPDATA%\DVS\Clipster</b>, for the actual location type in at a command line <b>echo %APPDATA%</b>, then press [Enter]).</p> <p>When exiting the software, a R&amp;S DVS information file (without <b>requested_</b> in front of the file name) is by default written to the stated location.</p> <p>Only the last ten files will be stored.</p>
<b>Reset button</b>	<p>The button <b>Reset</b> enables you to set the indication about how many frames were processed total and how many drops occurred during this time at the top right side of the chart back to zero. Afterwards you may start a new evaluation of the real-time performance of the software which in turn may report new drops in the table.</p> <p>This button does not reset the drop table of the performance monitor. For this you have to use the button Clear of the table controls.</p>

Right below the chart controls you can find the status bar which will provide you with status messages about the operation of the performance monitor.



Status message in the status bar

## The Drop Table

As soon as drops occur during your realtime operation, entries will appear in the drop table, one for each drop that could be detected.

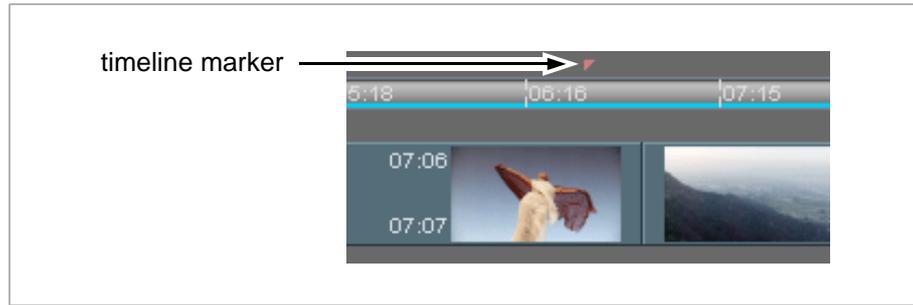
	Date/Time	Type	Timeline TC	Frame #	File Name	Path
1	04/24/08 / 11:40:50	display	09:26	296	american_beauty_...	V:/FILM4K/american_beat
2	04/24/08 / 11:40:50	display	09:29	299	american_beauty_...	V:/FILM4K/american_beat
3	04/24/08 / 11:40:50	display	10:00	300	american_beauty_...	V:/FILM4K/american_beat
4	04/24/08 / 11:40:51	display	10:01	301	hollywood_00000...	V:/FILM4K/hollywood/holly
5	04/24/08 / 11:40:51	display	10:02	302	hollywood_00001...	V:/FILM4K/hollywood/holly
6						

The entries provide information such as about date and time when the drop occurred or about the file that caused this drop.



Drops are reported by the realtime core of the R&S DVS software. In some cases it may not be able to provide information about the file name and/or path.

You can retrieve further information about the location where the drop occurred by double-clicking an entry in the drop table. Then the timeline cursor will jump to the approximate location where the drop happened and a timeline marker will be placed at this position in the timeline.



Timeline marker in timeline

## Table Controls

Table controls are used to save the results written in the drop table to a file or set markers in the timeline of the Edit Tool where drops occurred.





<b>Save</b>	Saves the entries in the drop table to a file. Contrary to the drop report saved by default by the performance monitor, this button only saves the entries currently available in the drop table.
<b>Mark All</b>	As soon as the realtime operation is finished and when drops have occurred, the button <b>Mark All</b> will be available. With it you can retrieve further information about the locations where drops occurred. It places timeline markers in the timeline of the Edit Tool for each entry available in the drop table.
<b>Unmark All</b>	Once the placing of the markers is finished, this button shows the labeling <b>Unmark All</b> . Then you can remove with it all timeline markers from the timeline in one step.
<b>Clear</b>	The <b>Clear</b> button deletes all entries displayed in the drop table. Afterwards you may start a new real-time operation which in turn may report new drops in the table. This button will be available as soon as drops are displayed in the drop table and the real-time operation is finished



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# Control Area

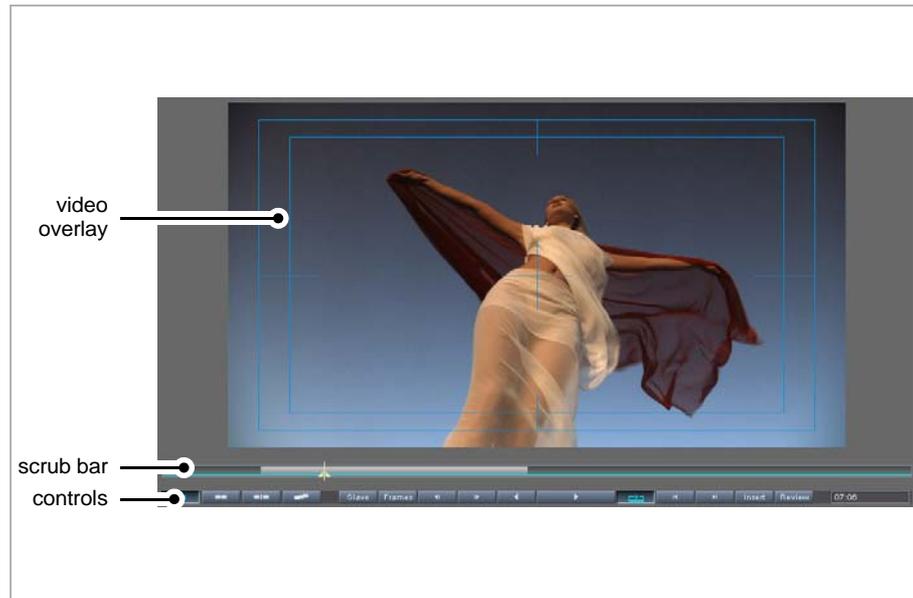
This chapter describes the features of the control area in detail. The control area is used to pre- and review your current project.

This chapter is divided into following sections:

- Control Area Overview (page 80)
- Video Overlay (page 81)
- Scrub Bar (page 94)
- Controls (page 96)
- Source-Edit Mode (page 98)
- Trim Mode (page 108)
- Slave Mode Control (page 113)

## Control Area Overview

In the control area in the edit mode you can see at its top the video overlay which is used to view the video material. Below the video overlay a scrub bar of the timeline is available. At the bottom of the control area you can find the controls to play out and move within your current project.



The control area

## Video Overlay

With the video overlay you can view the material present in the timeline. All clips and added operators to the timeline – as long as they do not require prerendering – can be viewed in realtime. While working, the video overlay will always adjust to your moves on the timeline. This provides a total control for your work and you can immediately monitor your progress.

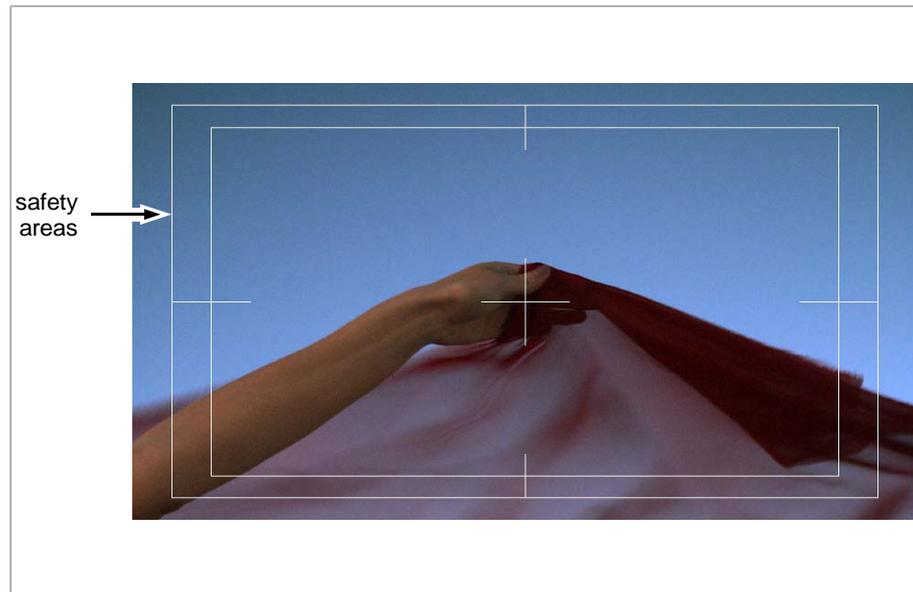
The video overlay will adapt its layout (aspect ratio) to the currently set video output raster of the timeline. Due to the fact that the output raster may have an effect on the video material of the timeline, you can use the video overlay to see its output effect immediately. For example, clips of different sizes in the video track(s) of the timeline may get cropped, stretched or compressed, or scaled according to your settings for the respective clips and your output settings. All these effects can be viewed instantaneously via the video overlay. Further information about how to set the video output raster can be found in "Video Output Configuration" (page 128) and "Audio Output Configuration" (page 130).

The following topics are covered:

- Video Overlay Configuration (page 81)
- Video Scopes (page 82)
- Head-up Display/Burn-In (page 88)

### Video Overlay Configuration

he video overlay provides action safety and title safety areas that can be turned off or adjusted to your personal needs. You can set both the color and the sizes of these areas, see also the Configuration Tool user guide.



Video overlay

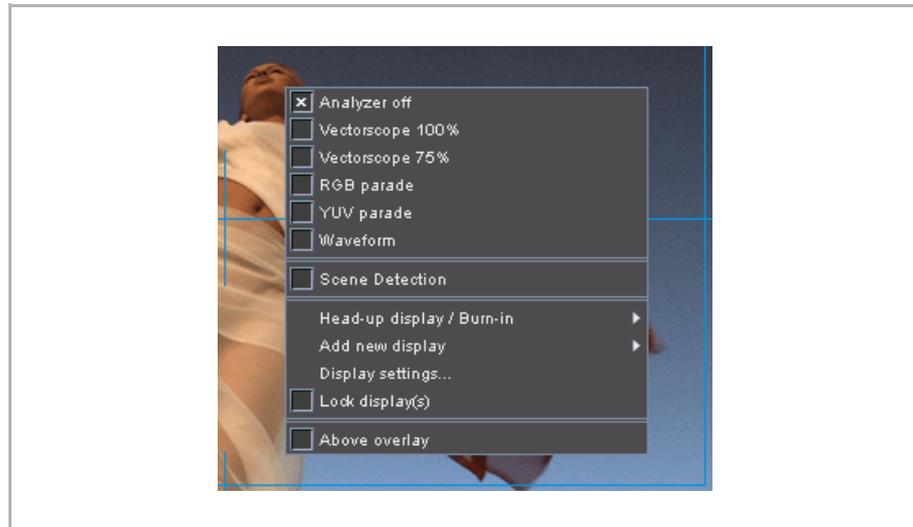
Furthermore, you can adjust the size of the video overlay with the edges of the control area at its very bottom and to the left. Simply enlarge or reduce the area by dragging the edges.

## Video Scopes

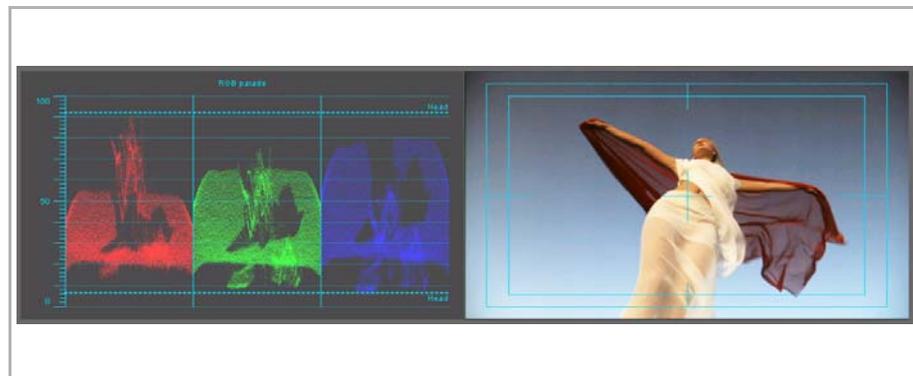
To monitor color corrections and to make sure that the images comply with broadcast standards, the video overlay of the Edit Tool provides video scopes to help you during such tasks.

### Under- standing Video Scopes

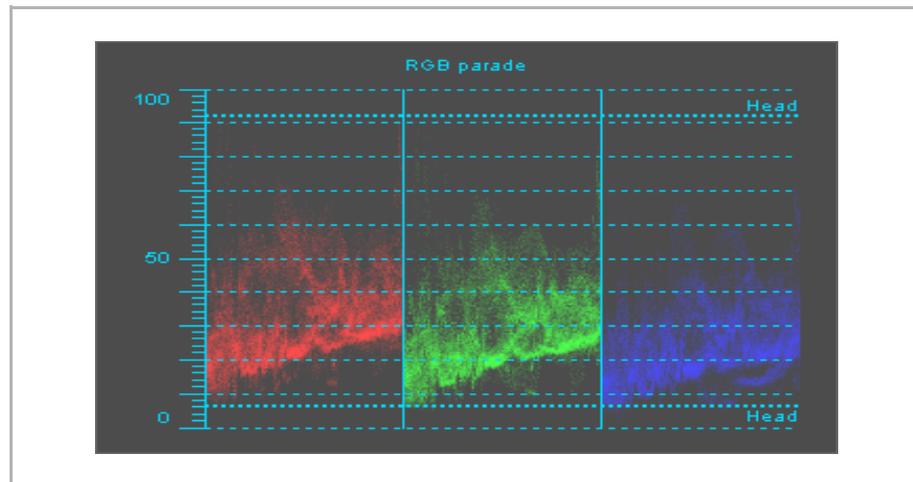
Use the video scopes to view the material, image for image if necessary, and assess the different color values (if needed, prior to processing as well as afterwards).



The R&S DVS software offers various scopes to choose from. Among them you can find waveform, vectorscope and parade monitors. Once one of the available video scopes is selected, the control area will change its appearance and two items will be displayed: the left one shows the selected video scope, while the right one displays the video overlay as usual.



With the menu option **Above overlay** available on the context menu of the control area this layout can be altered. When the menu option is deactivated, the scope and the overlay are displayed separately in the control area; when activated, the selected video scope will be superimposed on the video overlay



RGB parade superimposed on video overlay

Most video scopes provide in its graph an indication of the head-room. In case your project has to provide a legal broadcast signal, no color component should reach into that area. When staying on the computer side and working with RGB material, the headroom may be disregarded.

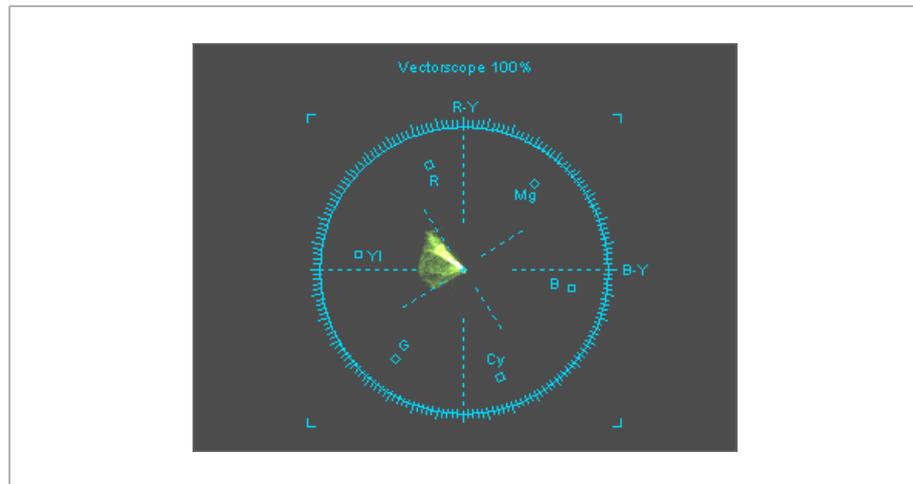
Use the **Analyzer off** to turn off the selected video scope again at any time.



The color of the graph, of the graph's background as well as of the drawn data (for vectorscopes and the YUV parade only) can be adapted to your needs via the Configuration Tool.

The menu option provides an RGB parade. For further information about this video scope see "Scene Detection" (page 189).

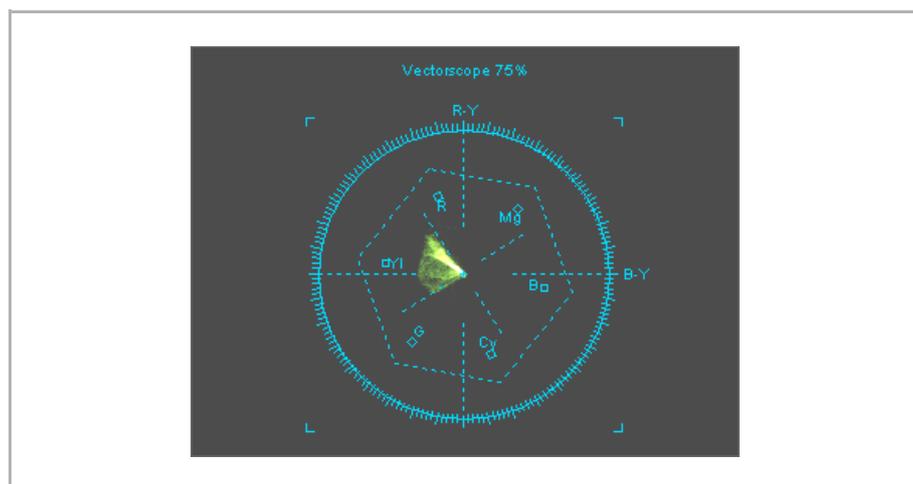
**Vectorscope** The vectorscope 100% is most suited when playing out in YUV. It displays the chroma information of an output image without its luma information, i.e. the color components U and V without Y.



This scope shows a circular graph where the center represents no chroma (color saturation zero). All white, black and grey parts of the output image are located at the center of the graph. The more the color values of an image increase, the farther away the graph's dots will be dispersed from the center. Regarding color the abbreviations 'R', 'G' and 'B' of the video scope indicate the usual primary colors red, green and blue, while 'Mg' stands for magenta, 'Cy' for cyan and 'YI' for yellow (secondary colors).

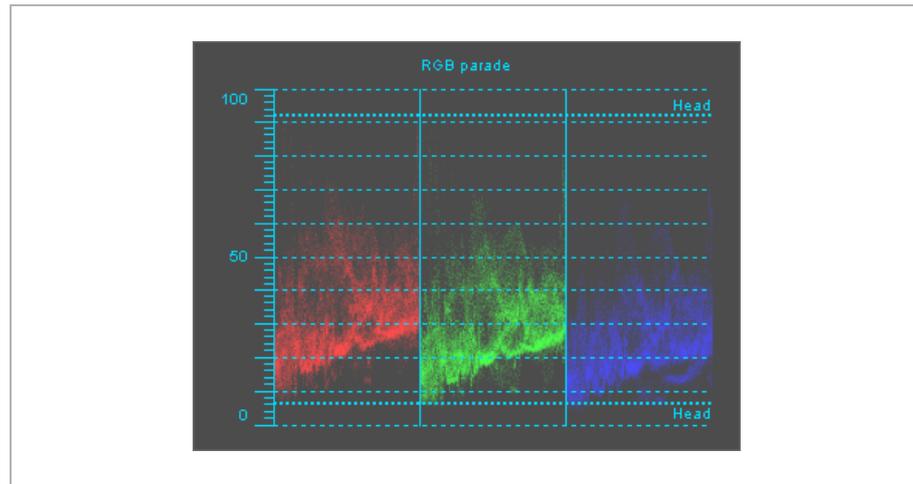
**Vector-  
scope 75%**

The vectorscope 75% is the same as the vectorscope 100%. However, to provide safe colors, for example, for a legal broadcast signal, this video scope already indicates the safety area of the colors: The dotted line represents the full color values (100%) whereas the squares show the colors with 75% of their values.



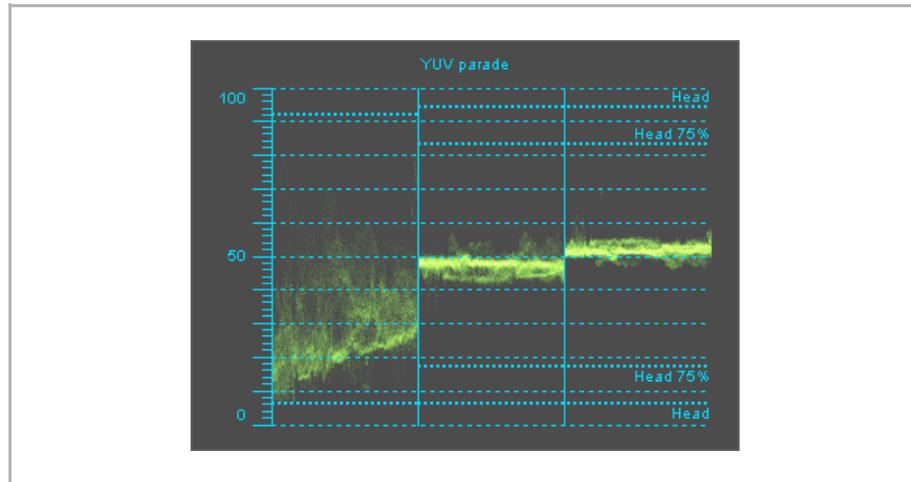
The colors of the output image should be located within the area enclosed by the squares. Any point beyond them will be located inside the headroom and it may not be possible to give it out correctly during a playout.

**RGB Parade** The RGB parade displays graphically the distribution of the color components red, green and blue (RGB). Each component is displayed separately. For a parade the output image is evaluated line by line, and for each line the color distribution is drawn.



White areas of an output image would appear as an accumulation of dots in all three color components near the 100% line (minus headroom, if applicable). Black image areas would be displayed as an accumulation of dots in all three color components near the 0% line (plus headroom, if applicable). When playing out in RGB, this video scope can be used to evaluate the color distribution of the output image accurately.

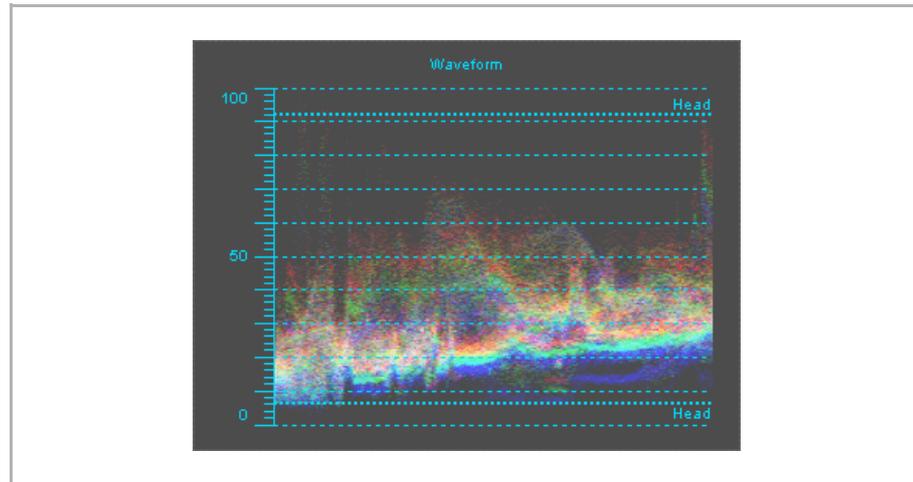
**YUV Parade** The YUV parade displays graphically the distribution of the components Y, U and V separately. The Y graph is shown on the left side, while the color difference signals U and V are displayed in the middle and to the right. As with the RGB parade the output image is evaluated line by line and for each line the distribution is shown.



Since U and V can take on negative as well as positive values their graphs usually are distributed around a center line. It can be found in the middle of the YUV parade because in digital video an offset of 128 (for 8 bit data) is added to U and V to get rid of the negative value. In case the output image is black and white only, U and V would be zero (128) resulting in a flat line in the middle of their graphs. The more the color saturation of an output image increases, the more the two graphs would be dispersed. Values of U greater than 50 in the graph indicate positive values and blue hues, while values of less than 50 indicate yellow hues and negative values. The same applies to V with the exception that values greater 50 would indicate red hues, and values less than 50 cyan hues. Regarding the luma signal Y a value of zero indicates black, while a value of 100 represents white. Nevertheless, especially when working with YUV, a reserved headroom for all components should be observed.

### Waveform

The waveform video scope is similar to the RGB parade. It displays graphically the distribution of the color components red, green, and blue (RGB) of an output image. For this, the image is evaluated line by line and for each the color distribution is displayed.

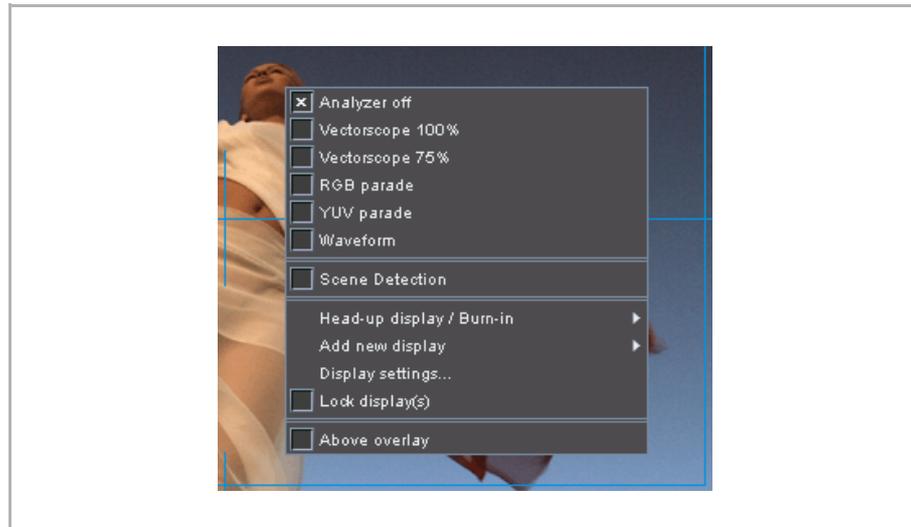


The horizontal scale of the scope represents the image's horizontal direction, while the vertical axis shows the RGB levels. The color components are drawn in their respective colors. The more scan lines of an image provide the same color at the same horizontal location, the more saturated the color will be in the graph. In case different colors are located at the same position with the same intensity, they would be added in the graph until the respective position shows white.

## Head-up Display/Burn-In

CLIPSTER offers you the possibility to display static (e.g. comments or logos) and/or variable information (e.g. timecode, keycode or clip and project properties) in the video overlay as well as at the SDI and/or auxiliary SD outputs of the DVS system. These information will be shown superimposed on the images and can be positioned and formatted freely.

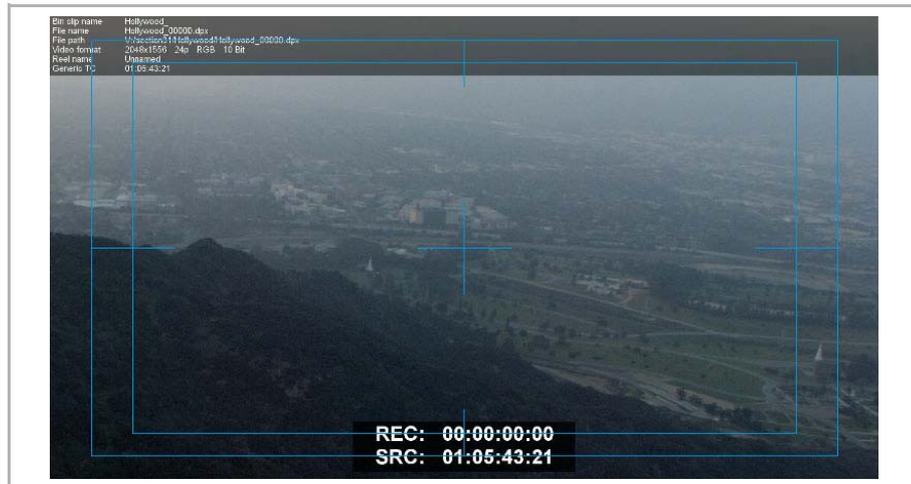
The head-up display/burn-in feature can be accessed via the context menu of the video overlay.



#### Context menu options

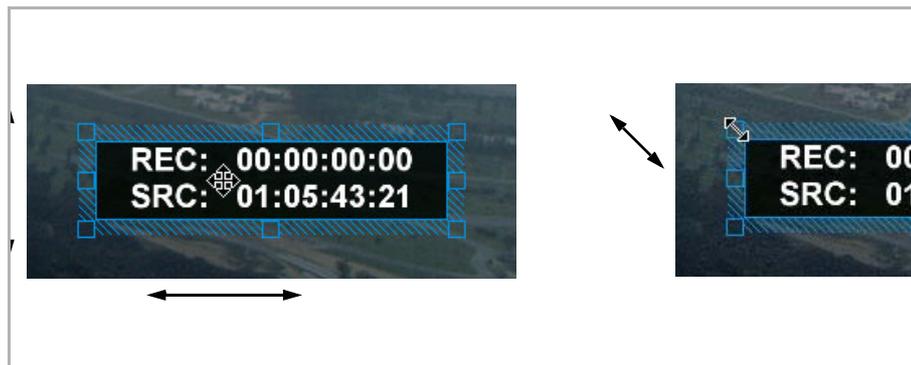
<b>Head-up display/ Burn-in</b>	These settings activate or deactivate the displays (superimposed information) for the video overlay and/or outputs.
<b>Add new display</b>	Adds a new display to the video overlay/outputs (e.g. an image or static or variable texts).
<b>Display settings...</b>	Allows you to add, delete and configure the displays.
<b>Lock display(s)</b>	When activated, the displays will be locked in the video overlay and cannot be changed with the mouse anymore.

Some sample displays are already preset in the software. Via the menu option Head-up display/Burn-in they can be activated or deactivated for the video overlay and/or outputs of the DVS system.



Video overlay with head-up display

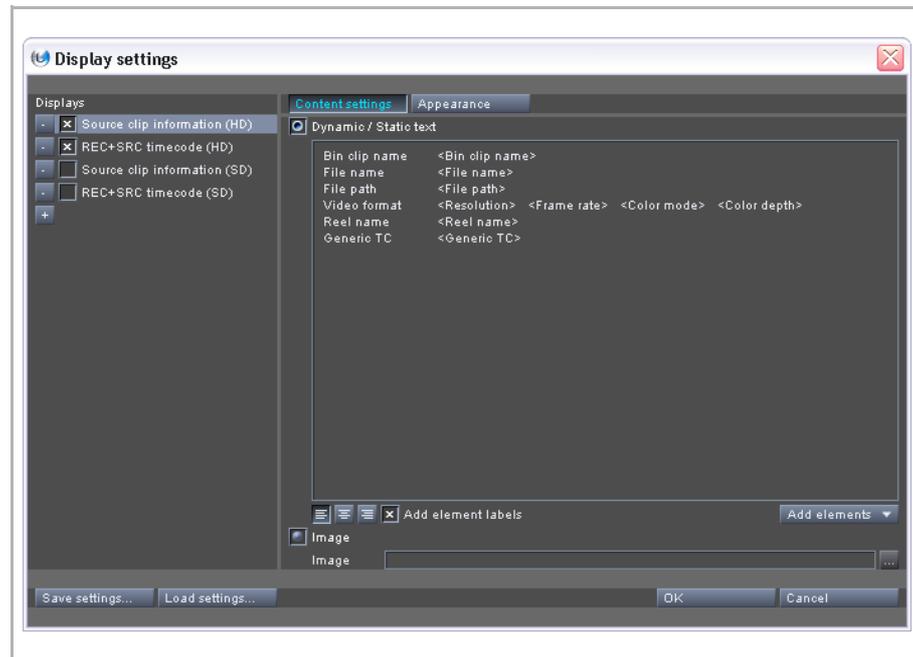
If not locked, the individual displays can be selected directly in the video overlay with a click of the mouse. Then they can be positioned or resized:



Positioning and resizing the burn-in information

Via the context menu of a marked display you can configure the displays, select all displays in a single step or delete the selected one(s).

The menu option **Display settings...** on the context menu of the video overlay or a marked display allows you to add, delete and configure the displays:



Configured displays can be found to the left. A new display can be added with the **+** button, while a **-** button deletes a display. Via the check boxes the displays can be activated or deactivated for the video overlay/outputs. By double-clicking the name of a display or by selecting the menu option **Rename** on its context menu, it can be renamed. Further editing features for the displays in general are provided by the context menu as well (e.g. **Add new display**, **Delete**, **Copy** or **Paste**). Once a display is selected, its properties will be shown in the settings pane to the right.

With the tab **Content settings** you can determine the content of the display. You can choose between dynamic/static text and an image via the radio buttons. When **Dynamic/Static text** is selected, you can enter the information that should be displayed directly in the entry field: Static information can simply be typed in, while variable information can be inserted with the **Add elements** combo box. They will be inserted at the current cursor position. Furthermore, for text fields the following items are available:



### Context menu options



These items align the text of the display.

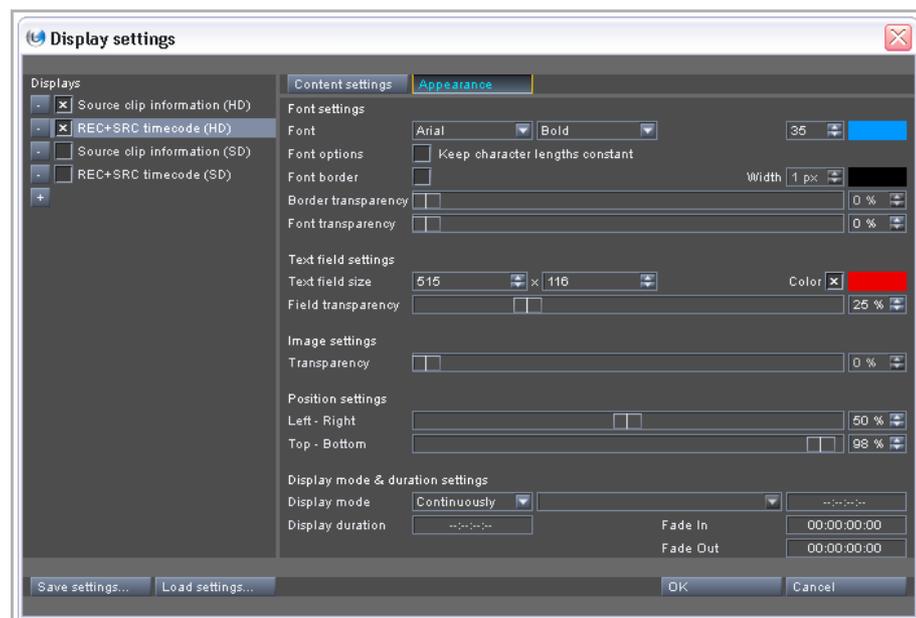
### Add new display



Removes or adds labels to the variable information. For example, when deactivating this check box, the labels of already entered variable information will be removed and newly added elements will be added without a label.

When Image is selected, you can enter the path to the image file in the entry field Image or select it with the button to the right. It will then be visible in the video overlay and/or at the outputs in its original resolution.

With the tab **Appearance** you can format the selected display:



On this tab you can, for example, set the font properties for text fields (such as type, size or color), determine transparencies, or position the display.

Additionally, with the Display mode & duration settings you can configure '**flash burn-ins**', meaning displays that will be visible for a defined period of time only. After setting the **Display mode** combo box to **Controlled** you can determine when the display should be shown (e.g. at the edit points of clips or at a certain time interval), its duration as well as the time to fade in and/or fade out the display

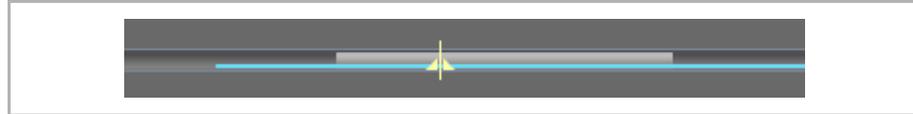


The display duration should be entered as the complete time for the visibility of the display, including fade-in and fade-out. Otherwise no fade-in/-out will occur.

Once a set of displays is fully configured, you can save them to a file (button **Save settings...**). This way you can create burn-in information for various purposes that can be loaded at any time later again (button **Load settings...**).

## Scrub Bar

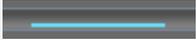
This section describes the scrub bar of the control area.



In contrast to the timeline of the timeline area where you can zoom in and out (see chapter "Timeline" (page 117)) the scrub bar of the control area always shows the complete timeline of the loaded project. You can use the scrub bar for overview purposes or to move within your project.

The scrub bar of the control area provides several features, for example, different colors indicating the state of the timeline.

Colors and Items	Description
in dark gray	Parts of the scrub bar displayed in dark grey indicate parts of the timeline that are not visible in the timeline area at the moment. You can change the size of this part by zooming in or out of the timeline (see section "Moving within the Timeline" on page 144).
in light gray	Parts in light gray show the part of the timeline that is currently visible in the timeline area. You can change the size of this part by zooming in or out of the timeline. Furthermore, by moving within the timeline you can change its position (see also section "Moving within the Timeline" on page 144). This part can be selected directly with the mouse and moved along the scrub bar to switch the view of the video and audio tracks in the timeline area to another part of the timeline.

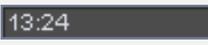
Colors and Items	Description
	<p>The blue line indicates the part of the timeline selected via the timeline's in- and outpoint. For information on how to set the in- and outpoint of the timeline see section "Setting an In- and Outpoint for the Timeline" on page 147.</p>
	<p>With the scrub bar cursor you can move within your project. Simply select the cursor with the mouse and move it along the scrub bar to the desired position. You can also click on a position outside the visible timeline area on the scrub bar directly to move the cursor and the visible part of the timeline there immediately. Additionally, with a mouse click directly below or above the part of the scrub bar in light grey you can position the scrub bar cursor there instantly.</p>



## Controls

At the bottom of the control area the controls to play out and move within your current project are located. In addition to other important buttons you can also find buttons to switch between the different modes of the control area here: the edit mode, the source-edit mode and the trim mod.

Item	Description
	<p>The Slave button activates the slave mode of the CLIPSTER. With the slave mode the R&amp;S DVS system can be controlled via RS-422 from another workstation, e.g. a VTR or a digital disk recorder. Then it will behave like a VTR by using preroll, postroll, etc. The specifications of these parameters can be found in section "Slave Mode Control" on page 113. When the slave mode is activated, the slave mode control window will be displayed on the screen. To clear the software from the slave mode, press the button <b>Close</b> of the window '<b>Slave mode</b>'.</p>
	<p>This button toggles between the frames or fields display mode. In its deactivated state, the frames of a video clip are displayed when stepping one frame/field backward or forward in the timeline. When activated, its fields will be displayed.</p>
	<p>With these buttons you can step one frame/field for- or backward in your project. The timeline cursor will move accordingly. Alternatively, you may use the keyboard shortcuts [<b>Left Arrow</b>]/[<b>Right Arrow</b>] or [<b>3</b>]/[<b>4</b>].</p>
	<p>With this button you can playout the timeline backwards, i.e. it will start a reverse playout. Once activated, the button changes its appearance to its active state. To stop the reverse playout, you have to click it again. Alternatively, you may use the keyboard shortcut [<b>J</b>] to start a reverse playout and [<b>Space</b>]/[<b>K</b>]/[<b>Shift + K</b>] to stop it. When increasing or decreasing the speed of the playout, the current speed (if negative) will be indicated in frames per second (fps) in this button.</p>

Item	Description
	<p>With this button you can start a playout of the timeline. After activation the button changes its appearance to its active state (  ). To stop the playout, you have to click this button again. Alternatively, you may use the keyboard shortcuts <b>[Space]/[5]</b> to start or <b>[Space]/[K]/[Shift + K]</b> to stop a playout. When increasing or decreasing the speed of the playout (see section “Keyboard Shortcuts” on page 486), the current speed (if positive) will be indicated in frames per second (fps) in this button (  ).</p>
	<p>With this button activated a playout of the timeline will be performed endlessly in a loop: Once the timeline cursor reaches the outpoint of the timeline, the playout will start from the inpoint again. To switch off the loop mode, deactivate this button.</p>
	<p>Jump to particular points on the timeline, such as cutting/edit points and timeline markers. The first button jumps to the point that is previously located on the timeline while the second button jumps to the next one. Alternatively, you may use the keyboard shortcuts <b>[A]</b> and <b>[S]</b>.</p>
	<p>This button toggles between the insert and overwrite mode.</p>
	<p>This button plays around the current position of the timeline cursor (± several sec.) in a loop. To deactivate the loop review, press the button Review again. The duration of the review can be configured freely with the Configuration Tool.</p>
	<p>This field shows the current position of the timeline cursor in timecode or frames notation. If you want to move to a certain position on the timeline, you can enter the position in the appropriate format here. After that press [Enter] and the cursor will then move to the entered position. For more information about the timecode/frame number fields and their format see section “Timecode / Frame Numbers Fields” on page 30.</p>

## Source-Edit Mode

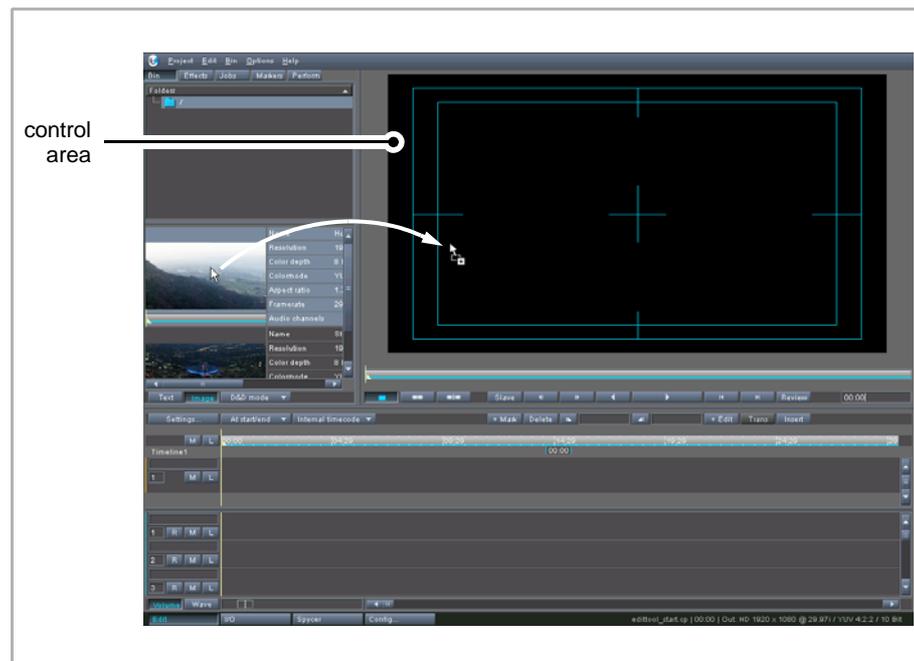
This section describes the source-edit mode.

The following topics are covered:

- Understanding Source-Edit Mode (page 98)
- Controlling the Clip from the Bin (page 100)
- Setting In- and Outpoints from the Bin (page 102)
- Processing the Source Material of a Video Clip (page 105)

### Understanding Source-Edit Mode

If you drag either a video or audio clip from the bin to the control area of the Edit Tool, the software changes to the source-edit mode.

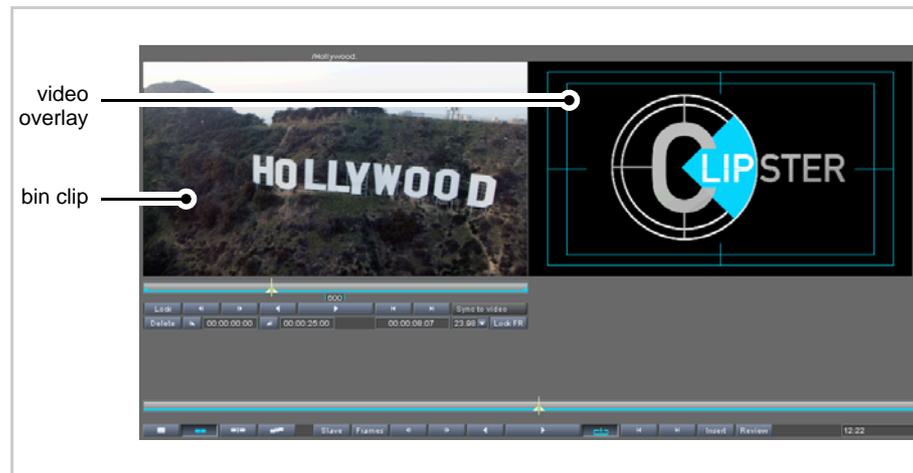


Drag and drop of clip to control area



The clip in the bin is neither removed nor deleted when it is dragged to the control area. It will remain there for future use so that you can add the clip (or other parts of it) to the timeline again.

You can also switch to the source-edit mode manually by pressing the respective button of the controls (see section "Controls" on page 96). In the source-edit mode there are two video overlays visible in the control area of the Edit Tool.



The left part of the control area shows the clip coming from the bin (in the following called 'bin clip'). Its contents will be displayed in the overlay to the left. The right part of the control area displays your current video overlay as it would be in the edit mode.

Audio clips can be used the same way as video clips in the source-edit mode. When dragging an audio clip to the control area, the audio clip will be shown in the video overlay with a part of its waveform. The length (duration) of the waveform displayed can be configured via the Configuration Tool.



The waveform of the audio bin clip is not displayed when performing a playout of this clip in the source-edit mode.

The entry fields of the bin clip are connected to the selected display type of the Edit Tool's timeline. For example, if source timecode is selected as the display type and such a timecode is provided by the clip, the bin clip's entry fields will provide the source timecode instead of a relative timeline timecode.

If your bin clip was already set to a preliminary inpoint in the bin, you will see the selected inpoint in this mode. How to set an inpoint for a clip in the bin can be read in section "Preparing Clips for Editing" on page 57.

In the source-edit mode you can select frame accurately an in- and outpoint for your bin clip. Once the in- and outpoint is set, you can drag the bin clip from the control area either to the timeline or back to the bin again to receive a copy of this clip with adjusted in- and outpoint in the bin.



While in the source-edit mode you can use the controls at the bottom of the control area as usual. They control the video overlay on the right side

Furthermore, although the edit mode is the most appropriate mode to perform editing tasks, you can also perform your work in this mode.

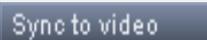
## Controlling the Clip from the Bin

Below the scrub bar of the clip from the bin (bin clip) you can find the controls to control the bin clip.



Audio clips provide the same trim and playout possibilities as video clips. The contents of the audio clip will be played out at channel 1 and 2 of the digital audio outputs. If these are routed to the analog outputs, you can hear the clip at these outputs, see "Video Output Configuration" (page 128).

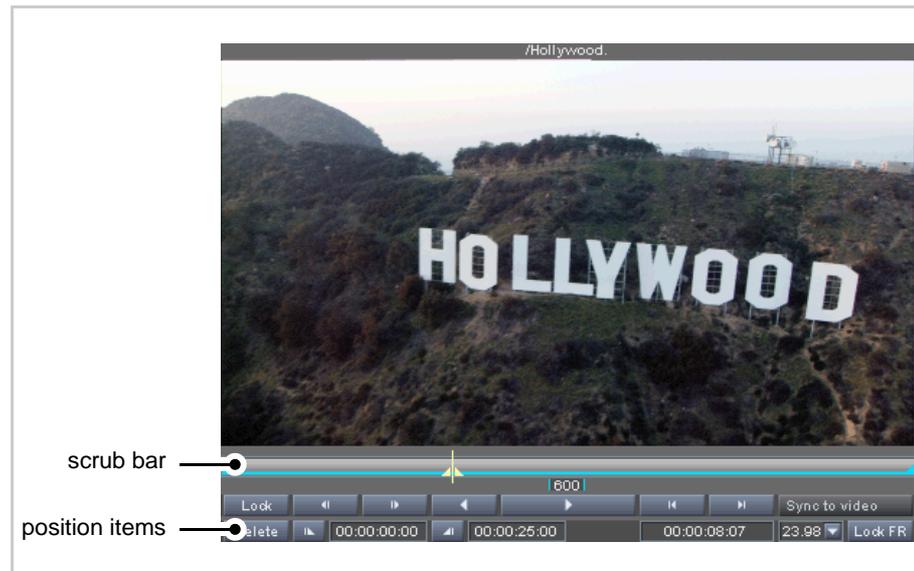
Item	Description
	<p>With the Lock button you can synchronize the timeline cursor of the timeline with the scrub bar cursor of the bin clip. Then the timeline cursor will adjust to your moves of the scrub bar cursor, for example, if you scrub the bin clip's scrub bar or move via the buttons to step for- or backwards. The way the synchronization is performed can be set with the Configuration Tool.</p> <p>This way you can check a conformed, offline composed project frame accurately with, for example, the master in the timeline and the offline edited clip in the source-edit mode..</p>
	<p>With these buttons you can step one frame/field for- or backward in your project. The timeline cursor will move accordingly.</p>
	<p>With this button you can playout the timeline backwards, i.e. it will start a reverse playout. Once activated, the button changes its appearance to its active state. To stop the reverse playout, you have to click it again.</p>

Item	Description
	<p>With this button you can play out the bin clip in real time. When a playout is initiated, the contents of the bin clip between the set in- and outpoint will be displayed in its overlay on the left as well as at the video output of the system. If the bin clip is an audio clip, the contents of the audio clip will be played out at channel 1 and 2 of the system's digital audio outputs. If these are routed to the analog outputs, you can hear the clip at these outputs as well (see "Video Output Configuration" (page 128)).</p>
	<p>These buttons move the scrub bar cursor to the next marked point on the scrub bar of the clip coming from the bin. Marked points are the start as well as end of the timeline or the set in- and outpoint. The first button jumps to previous points on the timeline while the second button jumps to next ones</p>
	<p>This button will be available when an audio clip is present in the source-edit mode. With it you can synchronize the audio to a video clip in the timeline: Move the scrub bar cursor for the audio and the timeline cursor for the video to their sync points (e.g. a slate's clap point). Then press this button. Afterwards the audio clip will be added to the timeline in sync to the video. To preserve this alignment during later editing work, the audio clip will be attached to the video clip same way as described in "Attaching Audio Clips to Video Clips" (page 175).</p>

## Setting In- and Outpoints from the Bin

When the video or audio clip from the bin (bin clip) has been dragged to the control area and the source-edit mode is activated, you can set the in- and outpoint of the clip frame accurately. For this you have to use the scrub bar and the position items:

### Bin clip in source-edit mode



Bin clip in source-edit mode

The scrub bar provides a timeline of the clip coming from the bin. You can use it and the position items to adjust the in- and outpoint of the bin clip.

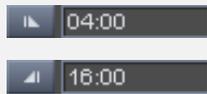


The entry fields are connected to the selected display type of the Edit Tool's timeline. For example, if source timecode is selected as the display type and such a timecode is provided by the clip, the bin clip's entry fields will provide the source timecode instead of a relative timeline timecode, see "Changing the Display Type" (page 127).



Audio clips provide the same trim possibilities as video clips. However, with the frame notation for the entry fields activated, the values will be displayed in milliseconds; when the file number viewing is activated, the values indicate individual samples.



Items	Description
	<p>The Delete button is a toggle button. If it is activated, you can delete the in- or outpoint by clicking the in- or outpoint button. Regardless of the position of the scrub bar cursor the in-/outpoint will be deleted.</p> <p>If the Delete button is deactivated, a click on the in- or outpoint button will set the in- or outpoint respectively at the current position of the scrub bar cursor.</p>
	<p>For a frame accurate positioning you may use the in- and outpoint entry fields. Simply type in in the entry field to the right of the in- or outpoint button the position of the in-/outpoint that the clip should provide when added to the timeline of the CLIPSTER. Then press [Enter] to take on the selected position. The in- or outpoint handler will be set accordingly. Further information about timecode/frame number entry fields can be found in "Timecode / Frame Numbers Fields" (page 30).</p>
	<p>The inpoint button sets or deletes the inpoint of the bin clip depending on the state of the Delete button. The inpoint will be set at the position of the scrub bar cursor.</p>
	<p>The outpoint button sets or deletes the outpoint of the bin clip depending on the state of the Delete button. The outpoint will be set at the position of the scrub bar cursor.</p>
	<p>The position field displays the current position of the scrub bar cursor on the scrub bar of the bin clip (its timeline). To move the cursor, you may enter a position and press [Enter].</p>
	<p>For example, if a shot is made in 24 fps, but audio is recorded in a different frame rate (or rather its header data states that it is), and you are looking for a certain timecode position in audio, you can recalculate the frames value of an entered timecode with this combo box: Set it to the correct frame rate. Then enter the timecode that the scrub bar cursor should jump to in the position field.</p>



Items	Description
	<p>With this toggle button you can lock the frame rate set in the combo box to left. This way you do not have to adjust the combo box every time you enter a timecode.</p>
	<p>With the scrub bar cursor you can move and view the contents of the bin clip. Simply select it and move it along the scrub bar. Additionally, you can control it via the controls, e.g. the play button, or the position field. Furthermore, with a mouse click anywhere below or above the scrub bar you can position the scrub bar cursor there instantly.</p>
	<p>The in- and outpoint handlers together with the blue line show you the selected part of the clip. To position them, you can select and move the in- and outpoint handlers with the mouse. They can also be set via the in-/outpoint position items.</p> <p>Once the final length of the clip to be inserted is set, you can move the selected part of the scrub bar (indicated by the blue line) with the mouse to position it.</p> 
	<p>The counter displays the length of a video clip in frames and of an audio clip in samples calculated from the set in- and outpoint handlers.</p>
<p>Scrub bar in dark gray</p>	<p>Parts of the scrub bar in a dark grey show the parts of the clip that were deselected via the set in- and outpoint. If you click on such a part, the scrub bar cursor will be positioned there instantly.</p>
<p>Scrub bar in light gray</p>	<p>Parts of the scrub bar displayed in light grey indicate the part of the clip that is selected via the set in- and outpoint. If you click above or below such a part, the scrub bar cursor will be positioned there instantly.</p>

## Setting the In- and Outpoints

Perform the following steps:



If your bin clip was already set to a preliminary inpoint, you will see the selected inpoint in this mode. Then you can adjust it more accurately.

1. If necessary, pull the scrub bar cursor out of the way to grab the in- or outpoint handler.
2. Select the in- or outpoint handler and move each to the desired position.
  - ▶ The still selected part of the scrub bar will be shown in light gray while the deselected part is displayed in a dark gray. Additionally, the counter will decrease:



For a frame accurate positioning of the in- and outpoint handlers you may also perform one of the following: Either enter the position of the in- and outpoint handlers in the in- and outpoint entry fields of the position items (then press [Enter]), or move the scrub bar cursor to the desired position and press the in- or outpoint button.



You can also work the other way around: you can first determine and set the length of the clip to be inserted and then move the part in light grey along the scrub bar with the mouse to position it.

When everything is set as desired, select the bin clip in its video overlay and drag and drop it either to the respective video or audio track of the timeline or back to the bin again to receive a copy of the bin clip with set in- and outpoint in the bin.

## Processing the Source Material of a Video Clip

In addition to setting an in- and outpoint for the bin clip, the source-edit mode also provides the possibility to select other applications than the software to process your video data with.



The CLIPSTER provides two ways to export either the original source material or a copied version of it to a third party application of your choice: You can export video data visible in the source-edit mode of the CLIPSTER, or you can export video data that is available in the timeline to another application. This way you can process the source material of a video clip further and afterwards use it again in the software without any difficulty. This topic describes how to process source material when a bin clip was dragged to the control area (source-edit mode) of the CLIPSTER.

When a bin clip is available in the source-edit mode of the control area, you can process its source material either by using the original data directly (destructive export) or by previously copying the material beforehand. To do this, you have to use the menu option **Export to application** on the context menu of the bin clip's video overlay:



Processing video material

The menu option **Export to application** opens a submenu where you can select another application than the software to process your video data.



To have an application available in this submenu, you have to define and set it first. This can be done with the Configuration Tool. Please note that you have to set the appropriate program parameters, if applicable, in the **Options** entry field as well.

**NOTICE****Data Loss**

The **Destructive export** option is valid for all specified external applications. If activated, the source data will always be processed directly. When saving the data in such a case with an external application, the source material will be overwritten.

As soon as an application under this option is selected, the video data will be transferred to the respective program according to your settings made for this application in the Configuration Tool.



In the source-edit mode of the CLIPSTER you can select an in- and outpoint for a clip to be added to the timeline. When sequence processing is activated, each frame between the set in- and outpoint of the clip will be sent to the external application

If a non-destructive export is selected for the external applications, the source material of the clip will be copied to the same path and location where the original material is stored with an incrementing number added to the directory name of the clip (**<name of clip's directory><incrementing number>**). After this the copied source material will be opened in the external application where you can process it. In the meantime a new bin clip will be added to the bin of the CLIPSTER which will refer to the location of the copied material. Once the material is processed with the other application, you can save it and then use the new bin clip as well as the unaltered original source in the software as usual (its bin clip is still present in the bin).

When a destructive export is selected for the external applications, no changes will be applied to the bin or the bin clip in the CLIPSTER. The source material is sent directly to the external application where it can be processed. Once the changes are saved, the material can be immediately accessed via the old bin clip in the software. However, due to the destructive export, your original source material on the storage will be lost.

## Trim Mode

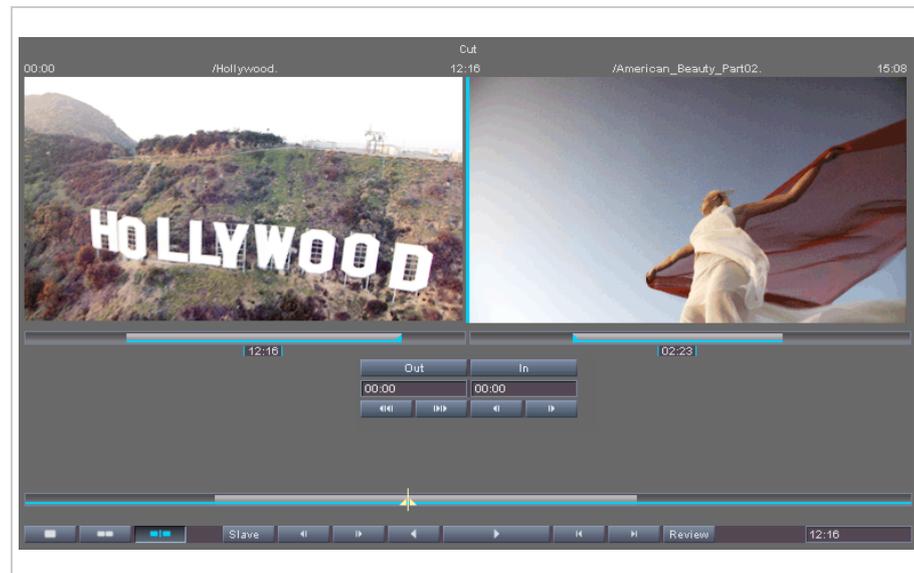
With the trim mode of the CLIPSTER you can change the in- and outpoint of adjacent clips to a cutting point, for example, if there are not enough head and tail available for a transition. When a transition is already applied to the cutting point, the in- and outpoint of the clips can be changed in this mode as well.

The following topics are covered:

- Understanding the Trim Mode (page 108)
- Trim Controls (page 110)
- Setting In- and Outpoints of Clips (page 112)

### Understanding the Trim Mode

As soon as two clips are present in the video track(s) of the timeline, the trim mode can be activated via its button from the controls, see "Controls" (page 96). Then the control area changes its appearance and you will see something like the following:



Trim mode

When the trim mode is activated, the Edit Tool will automatically jump to the nearest cutting point of the timeline and the timeline cursor will be positioned there accordingly. If the timeline cursor is positioned on another cutting point than the desired one, move it to the correct one with the respective controls (or key [A]/[S] on your keyboard). In this mode you cannot move inside the project as usual. The timeline cursor is restricted to the location of cutting points only.



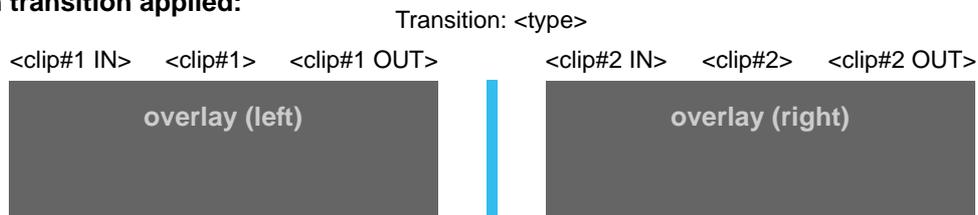
 In this mode you cannot move inside the project as usual. The timeline cursor is restricted to the location of cutting points only.

The control area in the trim mode shows then the two clips adjacent to the selected cutting point. The left overlay shows the outpoint and the last frame of the clip left to the cut/transition while the right one displays the inpoint and first frame of the clip to the right.

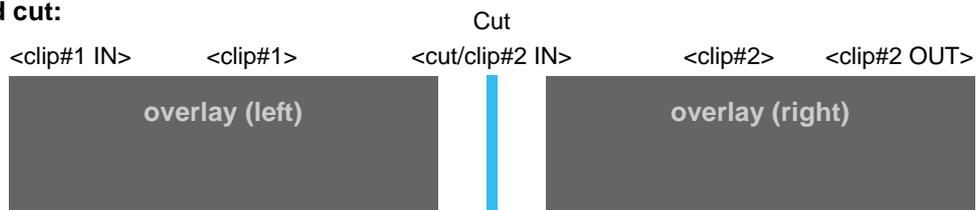
 If in- and outpoints were already trimmed for your clips, you will see the determined in- and outpoints in this mode. The selected parts of the scrub bars will be shown in light gray while the deselected parts are shown in dark gray.

Above each overlay you can find further information about the clip. Beside the name of each clip as it is present in the bin, you can get information about the clips' in- and outpoint on the timeline or, if applicable, about the type of transition that is applied to the cutting point:

**With transition applied:**



**Hard cut:**

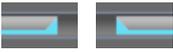
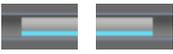


In- and outpoint information of a cutting point in trim mode

The in- and outpoint information are provided either in timecode or in frames depending on the selected notation for the Edit Tool (see "Configuring the Timeline Scale" (page 126)).

## Trim Controls

In addition to the in- and outpoint information and the overlays where you can see the end and start frame of the clips, the control area in the trim mode provides the following elements to control a trimming frame accurately.

Items	Description
	<p>The blue bar between the two overlays represents the cut between the two clips. It can be selected with the mouse and when moving the mouse cursor to the left or right, you can trim the out- and inpoint of the two clips adjacent to the cutting point simultaneously. Thereby you will extend the length of one clip while shortening the length of the other at the same time. With this kind of trimming the total timeline length is maintained.</p>
	<p>The out- and inpoint handlers can be selected and moved with the mouse to set the out- or inpoint of the clips.</p>
	<p>The counters below the timelines of the clips display the length of the clips in timecode or frames notation calculated from the set in- and outpoint handlers.</p>
	<p>These are the other in- and outpoints of the clips. They cannot be selected and moved. To adjust them, you have to jump to their respective cutting points.</p>
	<p>The <b>OUT</b> and <b>IN</b> buttons are toggle buttons. In their active state (  /  ) the respective in- or outpoint is selected for a trimming. The <b>OUT</b> button selects the outpoint of the clip to the left side of the cutting point. The <b>IN</b> button selects the inpoint of the clip to its right. Then the respective in- or outpoint can be changed with the controls below them.</p> <p> The <b>OUT</b> and <b>IN</b> buttons will change their state automatically when one of the trimming items above is selected directly for a trimming, e.g. when you select the blue bar or one of the in- or outpoint handlers.</p>

Items	Description
	<p>The two entry fields below the <b>OUT</b> and <b>IN</b> button allow you to monitor and adjust the trimming. The left field indicates the changes to the outpoint of the clip to the left of the cut, the right field displays the changes to the inpoint of the clip to the right. To use the fields to adjust the trimming, select the out- and/or inpoint with the buttons <b>OUT</b> and <b>IN</b>, then enter the trimming values (positive or negative) either in timecode or frames notation and press [Enter]. Further information about timecode/frame number entry fields can be found in "Timecode / Frame Numbers Fields" (page 30).</p>
	<p>With these buttons you can trim the out- or inpoint selected via the buttons <b>OUT</b> and <b>IN</b> one frame for- or backwards. The respective handler will move accordingly. If both buttons are activated, the out- and inpoint will be both adjusted simultaneously.</p>
	<p>These buttons allow you to trim the out- or inpoint selected via the buttons <b>OUT</b> and <b>IN</b> ten frames for- or backwards. The respective handler will move accordingly. If both buttons are activated, the out- and inpoint will be both adjusted simultaneously.</p>

## Setting In- and Outpoints of Clips

If clips are already present in the timeline of the CLIPSTER, you can change their in- and outpoint with the trim mode even if a transition is already applied to the cutting point. To do this frame accurately, you have various controls at hand either to monitor the trimming or to adjust it. Activate first the trim mode and position the timeline cursor at the desired cutting point between two clips.

Perform the following steps:

1. If not already set accordingly, select the appropriate out- or inpoint via the **OUT** and **IN** button of the trim controls: If you want to adjust the outpoint of the clip to the left of the cutting point, the **OUT** button has to be activated, if you want to set the inpoint of the clip to its right, the **IN** button has to be selected. If both buttons are activated, the out- and inpoint will be adjusted simultaneously.
2. Use the controls below the **OUT** and **IN** button to position them frame accurately.



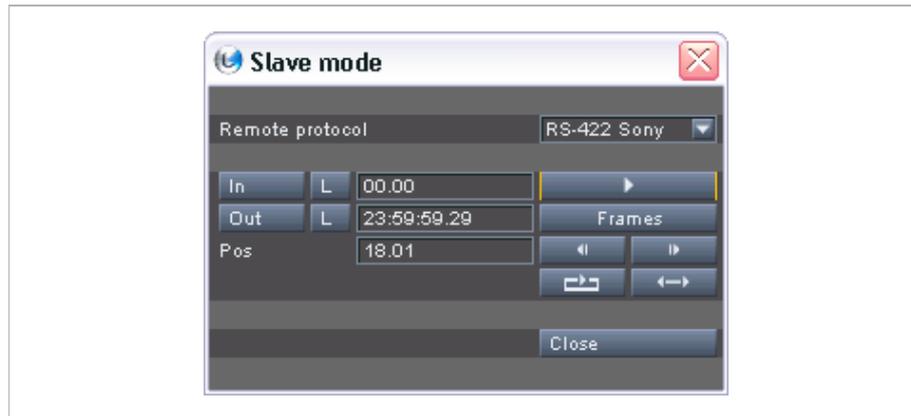
- ▶ The respective handler(s) will move accordingly. As well the counter(s) will in- or decrease for the selected clip(s). Your alterations are effective immediately in the timeline and you can now, for example, define a transition between the clips or perform a playout.
- ▶ To switch the control area back to the edit mode, use the appropriate button of the control area.



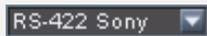
Points are now set.

## Slave Mode Control

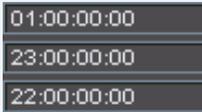
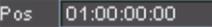
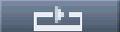
The software provides in some of its software modules a slave mode. Usually it can be activated with the button **Slave**. Then the following window may be displayed on the screen allowing you to control the respective software module without relinquishing the slave mode:



In slave mode the system will behave like a VTR by using preroll, postroll, etc. The specifications of these parameters can be found in section "Slave Mode / RS-422 Control" on page 514. This section explains the items provided by the **Slave mode** window.

Item	Description
	Select from the <b>Remote protocol</b> combo box the RS-422 protocol that should be used to control the R&S DVS system (see also section "Slave Mode / RS-422 Control" on page 514).
	The buttons <b>IN</b> and <b>OUT</b> enable you to select an in-/outpoint directly from the current position of the timeline cursor. Move the timeline cursor via the <b>Pos</b> field or its controls (see below) to the position that you want to set. Then press the respective button and the entry field to its right will take on the selected position. With an activated in- or outpoint these buttons allow you to jump to the in-/outpoint directly.
	These buttons activate the in- and outpoint set in their corresponding entry fields to the right.



Item	Description
	<p>To position the in- and/or outpoint, you can also enter a particular position in the entry fields to the right directly. For an activation of an in-/outpoint you may press <b>[Enter]</b> or use their activation buttons.</p>
	<p>The <b>Pos</b> field indicates the current position of the timeline cursor, for example, during a playout operation of the Edit Tool's timeline. Also, it can be used to move the timeline cursor by entering a particular position in its entry field.</p>
	<p>With this button you can play out the contents of the timeline in realtime. When a playout is initiated, it will be displayed in the video overlay of the control area as well as at the video and/or audio outputs of the system. After activation the button changes its appearance to its active state and you have to press it again to stop the playout.</p>
	<p>This button toggles between the frames or fields display mode. In its deactivated state, the frames of a video clip are displayed when stepping one frame/field backward or forward in the timeline. When activated, its fields will be displayed.</p>
	<p>With these buttons you can step one video frame/field for- or backwards in the timeline. The <b>Pos</b> field will indicate this accordingly.</p>
	<p>With this button activated a playout of the timeline will be performed endlessly in a loop: Once the timeline cursor reaches the outpoint of the timeline, the playout will start from the inpoint again. To switch off the loop mode, simply click this button again.</p>



Item	Description
	This button activates the forward-backward play mode of the timeline. In this mode an endless playout of the timeline will be performed once a playout is started: When the timeline cursor reaches the outpoint of the timeline, the playout will be reversed and the timeline is played backwards (speed -1) until the inpoint is reached where the playout will be performed forward again. To switch off the forward-backward play mode, you have to click this button again.
	This button deactivates the slave mode and closes the ' <b>Slave mode</b> ' control window.

## Control Area

▶ Slave Mode Control

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# Timeline

For the editing process the Edit Tool provides a timeline with video tracks where you can add the clips in the desired sequence as they should be played out in the end.

This chapter explains how to work with the timeline in detail. It will be discussed how to add clips to the timeline and how to work with them.

This chapter is divided into following sections:

- Adding Clips to the Timeline (page 118)
- Timeline Configuration (page 123)
- Controlling the Timeline (page 144)
- Working with the Timeline (page 153)
- Working with Video Clips (page 180)
- Working with Audio Clips (page 195)
- Working with Dolby® Atmos (page 202)
- Timeline Element Properties (page 210)



## Adding Clips to the Timeline

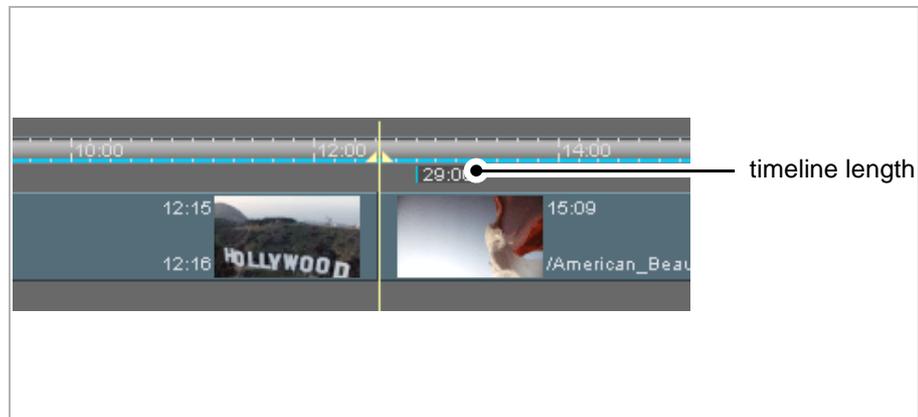
To begin an editing work, you have to add the clips to the video tracks of the timeline first. You can add clips of different formats to the timeline because the R&S DVS software works format independent and is capable of handling even high-resolution film material.

The following topics are covered:

- Adding a Clip Directly from the Bin (page 118)
- Adding a Clip from the Control Area (page 120)
- Drag-and-drop Mode Settings (page 121)

### Adding a Clip Directly from the Bin

You can take a clip directly from the contents area of the bin and add it to the tracks of the timeline. Afterwards the length of the timeline will be indicated in the field directly below the timeline scale (length of the timeline's in- and outpoint, see also section "Setting an In- and Outpoint for the Timeline" on page 147).

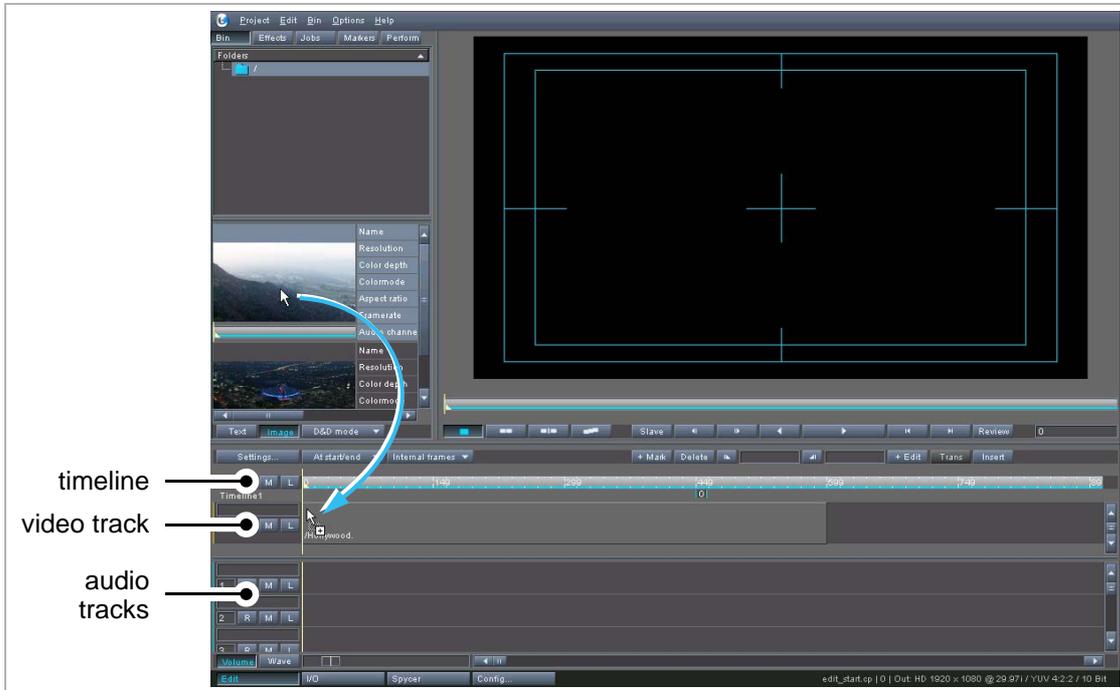


When adding of clips to the timeline, the clip will be visible in the video or audio track of the timeline and it may react to certain elements of the timeline (snapping mode) to allow for an automated positioning.



When adding or moving clips in the timeline, you have to heed the current insert/overwrite mode of the timeline.

Clips are dragged from the contents area of the bin and dropped into a video track. Once the mouse button is released, a representation of the clip is added to the timeline.



When using clips from the bin, they are neither removed nor deleted there. They will remain in the bin for future use so that you can add the clip (or other parts of it) to the timeline again.

The clip will be placed at the position of the mouse pointer where the mouse button was released.



After adding a clip to the timeline, a gap may appear. Gaps can be indicated by a red line in the timeline scale. If this occurs, you can move the clip easily to the beginning of the timeline with a double-click of the mouse on the timeline scale.

While the starting point of the clip (its position and inpoint) within the timeline in most cases is determined during the drag-and-drop procedure (e.g. by the position of the mouse pointer), its outpoint then usually is defined by the length of the clip.



If more than one clip is selected for the drag-and-drop procedure, the CLIPSTER will either align the clips horizontally in one track of the timeline or put each clip into another track directly below the selected one. This drag-and-drop behavior can be configured with the Configuration Tool.

## Adding a Clip from the Control Area

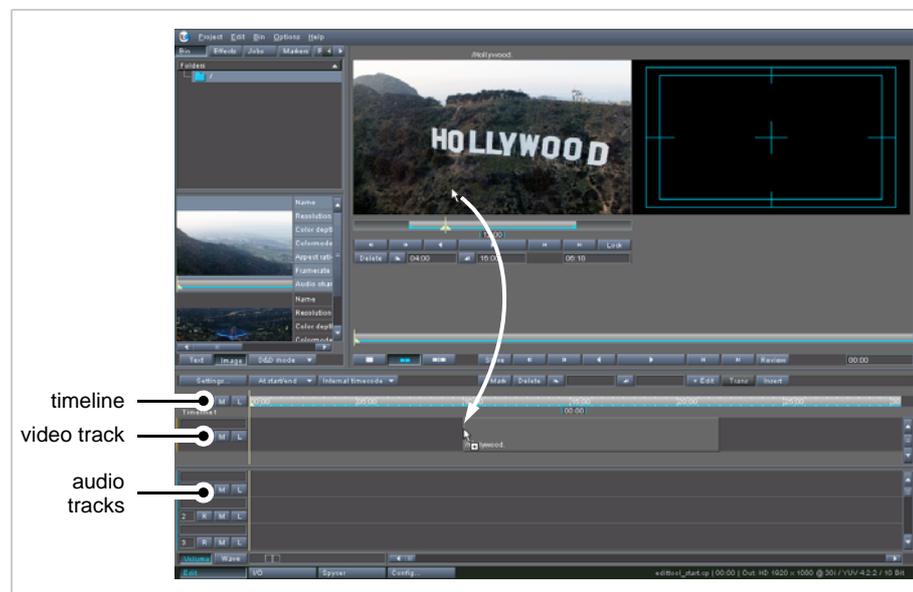
When a clip from the bin is dragged to the control area, the source-edit mode is activated where you can set the in- and outpoint of the clip frame accurately.

To add a clip, select it from the bin in its video overlay and drag and drop it to a video or audio track of the timeline.



Video clips can only be dragged to the video track(s) of the CLIPSTER and audio clips only to the audio tracks.

Alternatively, video clips can be added from the source-edit mode to the timeline by using the keyboard shortcuts [V] (in insert mode) or [B] (in overwrite mode). They will be added at the position of the timeline cursor.



*Drag and drop a video clip to timeline*

Once the mouse button is released, a representation of the clip is added to the timeline. How or where the clip is added to the timeline is determined by the drag-and-drop mode settings.



After adding a clip to the timeline, a gap may appear. Gaps can be indicated by a red line in the timeline scale. If this occurs, you can move the clip easily to the beginning of the timeline with a double-click of the mouse on the timeline scale.

While the starting point of the clip (its position and inpoint) within the timeline in most cases is determined during the drag-and-drop procedure (e.g. by the position of the mouse pointer), its outpoint is defined by the set outpoint made in the source-edit mode. These attributes can be changed easily after the clip was added to the timeline.

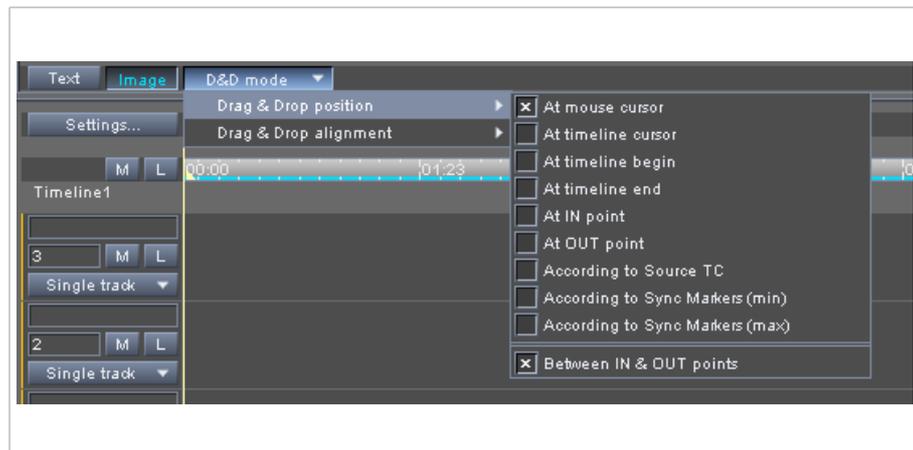


If you drag an audio clip to the timeline that contains more than one mono or stereo channel (multiple channels), the additional channels will be added to the other audio tracks below the selected one.

To switch the control area back to its edit mode, use the appropriate button of the control area ().

## Drag-and-drop Mode Settings

The drag-and-drop mode settings **D&D mode** determine how or where to add clips to the timeline when adding them via drag-and-drop, for example, from the bin. You can find these settings in the button area of the bin.



Drag-and-drop modes of the bin



On the submenu of the Drag & Drop position menu option you can specify where the clips should be added to the timeline (e.g. at the mouse or timeline cursor position or at the in- or outpoint of the timeline). When the setting between IN & OUT points is activated, clips can be added between the specified in- and outpoint of the timeline.

Via the Drag & Drop alignment menu option you can configure if several clips selected in the bin should be added either horizontally in one track of the timeline or vertically, each to a track of its own. To add video clips vertically to the timeline, the timeline has to be configured to contain more than one video track.

## Timeline Configuration

The timeline can be configured freely and thus adapted to your individual needs. For a more comfortable working you can change the layout of the timeline area in various ways. Most configurations and settings will be stored together with your project in a project file.

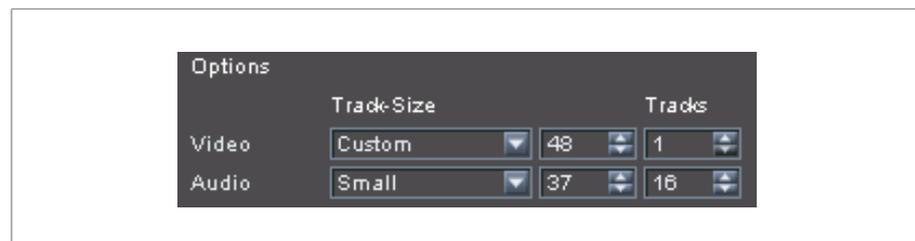
The following topics are covered:

- Video Track Properties (page 123)
- Changing the Appearance of Video Clips (page 125)
- Configuring the Timeline Scale (page 126)
- Configuring the Tooltips of Clips (page 126)
- Changing the Display Type (page 127)
- Video Output Configuration (page 128)
- Audio Output Configuration (page 130)
- Loading and Applying a 3D LUT File (page 135)
- Cropping the Timeline (page 138)
- Applying an ASC CDL (page 141)

### Video Track Properties

Via the **Settings...** button you can alter the size and number of video tracks. It is located at the top left side of the timeline area. After pressing this button the **'Timeline output settings'** window is displayed.

At the bottom of this window you can find in the Options area further optional settings. To the left you can find settings to alter the size and number of the video and audio tracks in the timeline.





With the fields for the track sizes you can adjust the height of the tracks for video separately. Either change the sizes by selecting one of the preset sizes from the combo boxes to the left (Small, Medium, Large) or enter the pixel height manually in the adjoining entry fields.



Individual track sizes can also be manually configured for each track in the timeline area.

Additionally, you can find here to the right entry fields where you can set the amount of video tracks that will be visible in the timeline area.

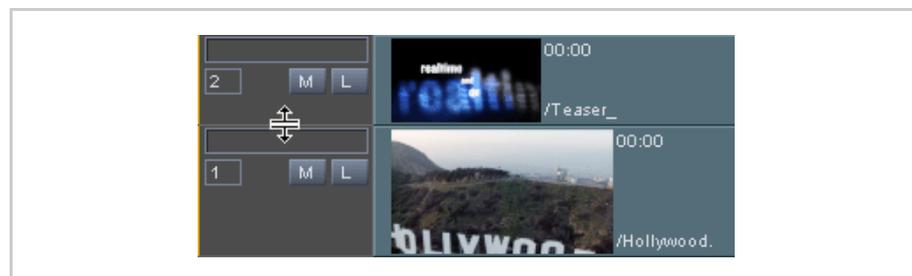


Tracks can also be added and removed via the context menu of a clip/timeline track.

Working with several video tracks vertically in the timeline is different from the usual approach of a horizontal editing in a timeline, since the different tracks of the timeline form a stack. Further information about this and how to work with vertical editing can be found in "Vertical Editing of Video Clips in the Timeline" (page 188).

The track sizes can also be manually set in the timeline area. Setting the tracks to individual sizes may be useful in case you want to focus on important tracks or display an audio track with an audio waveform more clearly, see also "Waveform Display" (page 200).

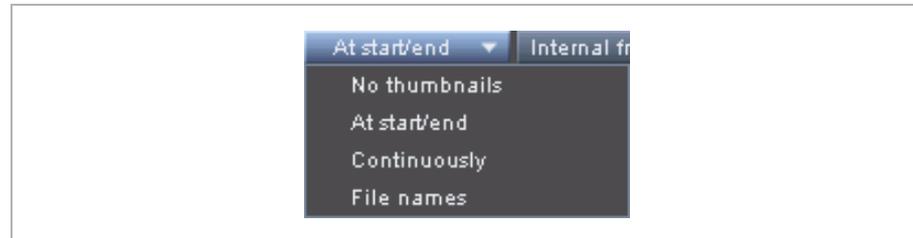
The video and audio tracks can be adjusted to an individual height. For this you have to move the bottom line of a track (separation line) in the area right in front of the tracks with the mouse:



Setting track sizes manually

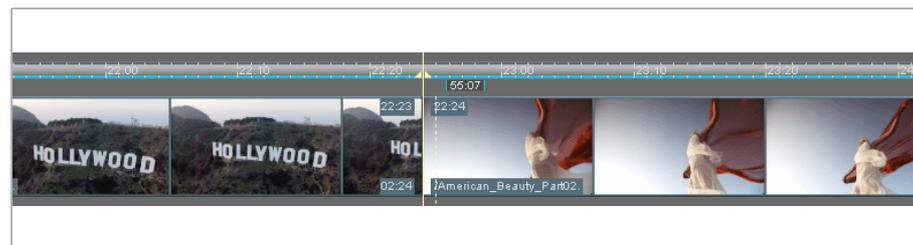
## Changing the Appearance of Video Clips

To the right of the **Settings...** button you can find the thumbnails combo box. When you click on the arrow to the right of the combo box, you will receive a drop-down list:



List of thumbnails combo box

From this list you can select the view of the video track(s), i.e. you can select the way the clips' representations are displayed in the video track(s). For example, the clips can be shown with continuous thumbnails in the video track(s):



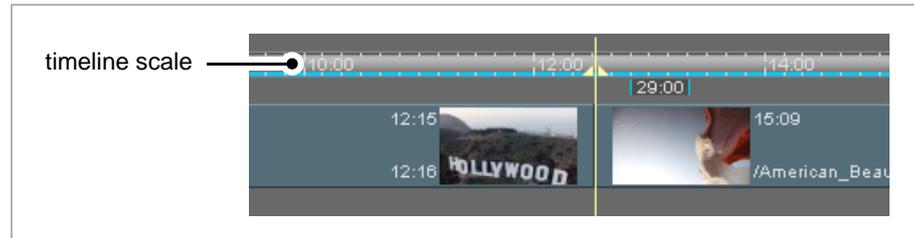
Continuous thumbnails

The video clips can have the following appearances:

Selection	Description
No thumbnails	The clips' representations in the video track(s) of the timeline are shown without thumbnails.
At start/end	Thumbnails of the clips are displayed at the start and the end of the clips only.
Continuously	All clips in the video track(s) are filled with thumbnails continuously (as shown in the example figure above).
File names	Instead of seeing the thumbnails continuously, the clips are filled with their file names instead, i.e. you will see the original file names of the respective image files throughout the clip which may be especially helpful during frame-accurate editing.

## Configuring the Timeline Scale

The timeline scale can be adapted to the needs of your project. You can either set a special offset or switch the notation of the scale.



Timeline scale

To set a timeline offset, for example, to match the current project with other projects, you have to use the **TC - Offset** item of the output settings window (see section “Video Output Configuration” on page 128). The timeline of the Edit Tool will then provide this offset.

Additionally, the timeline scale as well as all position and length indicators in the Edit Tool can be switched from a display of the timecode notation to frame numbers and vice versa. Further information about this can be found in section “Timecode / Frame Numbers Fields” on page 30.

## Configuring the Tooltips of Clips

All clips added to the timeline of the Edit Tool, i.e. video as well as audio clips, provide various information via tooltips. These information will be displayed as soon as the mouse cursor is placed over a clip:



Tooltip of video clip

Then you can see, for example, the file name of the clip or its in- and outpoint on the timeline. The information displayed via the tooltips can be adjusted freely to your individual needs with the Configuration Tool of the DVS software (.).

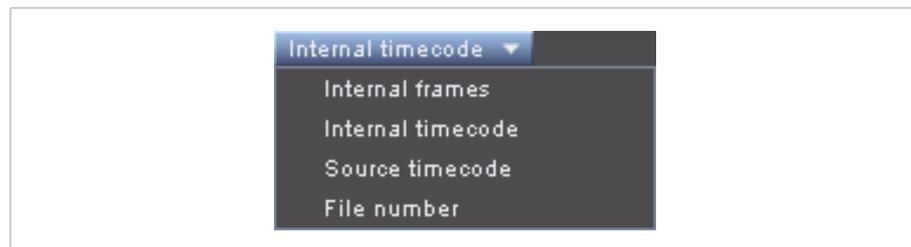
Additionally, you can turn on or off the tooltips of the clips in the timeline. For this call up the context menu on either a video or audio clip and select the menu option **Enable tooltip** or use the Configuration Tool.

## Changing the Display Type

To the right of the thumbnails combo box you can find the display type combo box where you can set the way position information are displayed by clips in the CLIPSTER

The position information of clips are shown, for example, in their text information after they were added to the timeline or in the entry fields of a bin clip in the source-edit mode of the control area, see "Source-Edit Mode" (page 98).

When you select the arrow to the right of the combo box, a drop-down list will be available where you can set the display type:



List of the display types

Selection	Meaning
Internal frames	The clips show positions according to an internal frame count. This setting also activates the frame notation for the CLIPSTER.
Internal timecode	The clips show positions according to an internal timecode count. This setting also activates the timecode notation for the CLIPSTER.



Selection	Meaning
Source TC	The clips show positions according to the timecodes provided by their file headers and set either via the Configuration Tool or the clip's properties. If the clips do not provide a source timecode of their own, no timecodes will be displayed by the clips. However, they can be configured to show a virtual source timecode via their properties in the bin. Further information about source timecode can be found in "Source Timecode" (page 28). This setting also activates the timecode notation for the CLIPSTER.
File number	The clips show positions according to the numbers of their respective image files, e.g. the image Hollywood00231.dpx as the starting point of a clip will be shown with 231. This setting also activates the frame notation for the CLIPSTER.

## Video Output Configuration

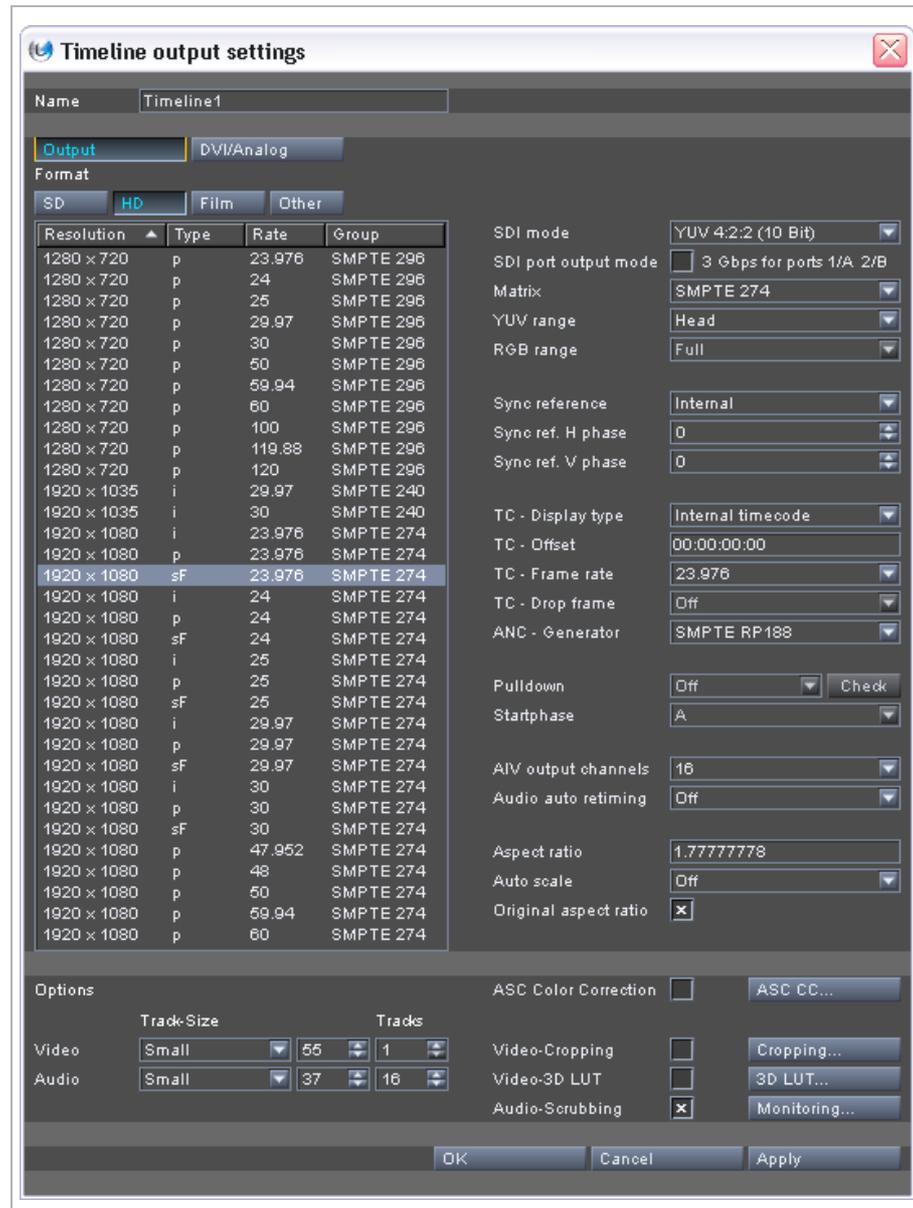
To output video/audio and to view your project's timeline with a monitor connected to the R&S DVS system, you have to configure the output format of the timeline accordingly.

With the button **Settings...** at the top left side of the timeline area you can determine the output format (video raster) of the project. Additionally you can find here various other settings concerning the timeline or its output.

In the CLIPSTER you can set different video format settings either for the SDI or the DVI and analog outputs. Once set, the respective format(s) will be automatically applied to the output ports of the system. By default the DVI/analog output settings are linked to the video output format of the SDI and, if not configured otherwise, will be set to the same raster.



The selected SDI output raster is applied to the video overlay and it may have an effect on the images displayed there (e.g. they may get cropped). You can use the video overlay to see the effects immediately because it will always show the exact content of the outgoing signal.



Output settings window

As a standard after selecting the video format settings the SDI output configurations are displayed. Use the provided items to set the video format accordingly. In this window you can also set the software to an autoscaling of the material to be played out if its original resolution differs from the configured output raster. Additionally, you can determine here the amount of audio channels that will be embedded in the video signal (AIV). This is provided because some external devices have difficulties when handling embedded audio that provides more than four audio channels.



With the tabs at the very top you can set the output format for the different ports. The output video format can be set separately for the SDI and the DVI/analog outputs. The settings items of the tab DVI/Analog will be available once the check box **Lock to Output** is deactivated.

As soon as you confirm your settings with the OK button, they will be in effect. The in- and outputs of the system (except the SD outputs) will change their format respectively. Depending on the selected video format for SDI the video overlay of the CLIPSTER may change its aspect ratio (16:9, 4:3, etc.). In the Configuration Tool you can configure the SD outputs as well as set an output raster that the software should use as the default raster after starting a new project.



Rasters for film not included in the SDI standard (i.e. 2K with 20 Hz or more) are output via the analog and DVI outputs only.

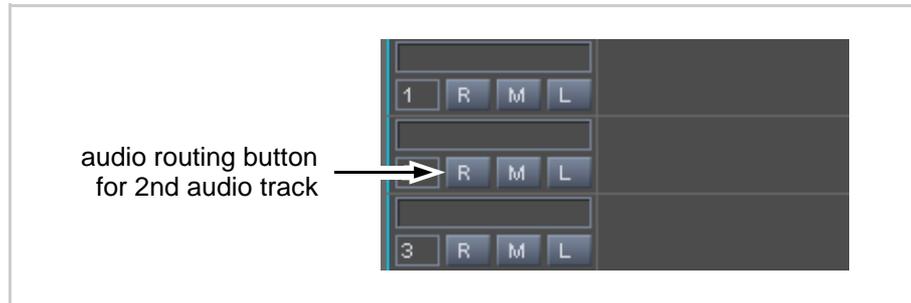
In the '**Timeline output settings**' window you have further configuration possibilities at hand via the **Options** area at the bottom of the window. There you can configure the following:

- The video and audio track sizes as well as the number of tracks.
- The analog audio outputs to monitor audio during your editing work, see "Audio Output Configuration" (page 130).
- A 3D LUT file to be used for the timeline (optionally available, see "Loading and Applying a 3D LUT File" (page 135).
- A cropping for the whole timeline, see "Cropping the Timeline" (page 138).
- An ASC CDL that should be applied to the timeline, see "Applying an ASC CDL" (page 141).

## Audio Output Configuration

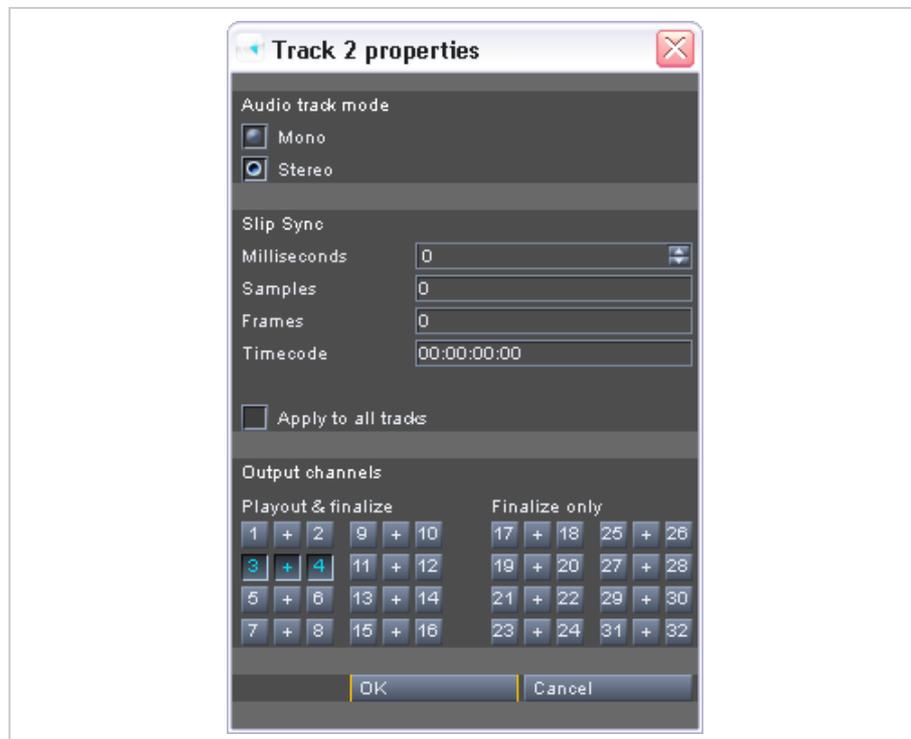
The timeline area contains several audio tracks where you can add audio clips in the desired sequence and set fade-ins and -outs. To output audio via the digital audio outputs of the DVS system, you have to configure the audio output accordingly.

In the areas preceding the audio tracks you can find the audio routing button **R**.



Button to configure the audio output settings

With these buttons you can set for each track separately the audio output. After pressing one of the **R** buttons the following window will be displayed:



In the area **AUDIO TRACK MODE** select whether the audio mode of the track should be mono or stereo. The CLIPSTER applies the selected audio mode directly to the respective audio track and it will be down- or upmixed before it reaches any output.

While the smallest unit of a video clip is a single frame/field, the smallest unit of an audio clip is a sample. The system provides up to 48,000 samples per second of audio (48 kHz) opposed to the respective video frequency setting (frames per second) for the video output. With the area **SLIP SYNC** you can bring your video and audio output into synchronization by adjusting the audio



offset. For this the area provides different settings items where you can specify the positive or negative offset value either in milliseconds, samples, frames, or via a timecode. If you adjust one setting, the other ones will be set accordingly. With the check box **Apply to all tracks** the adjusted offset can be transferred to all other available audio tracks easily: Simply enable the check box and confirm your setting with the OK button to apply the synchronization settings to all audio tracks.

In the area **OUTPUT CHANNELS** you can select the digital audio channel(s) that should be used for an output with a click on the respective button (finalizing and/or hardware output). An activated + button between two channels configures the two channels to stereo.



The hardware of the R&S DVS system is capable of outputting 16 different audio channels. For a finalizing there are another 16 audio channels available (32 channels in total), because some audio file formats can handle more than 16 channels.

With the settings of the area **Audio track mode** and the ones of the area **Output channels** you can mix the audio signals of your project according to your needs.

If the audio clip in the timeline is in mono, it does not matter whether the audio track is set to stereo or mono. The output on all selected channels will be the same, i.e. the mono audio clip as it is available in the timeline.

Audio Clip	Audio Track	Output
Mono	Mono	Mono of clip
Mono	Stereo	Mono of clip



If the audio clip is in mono, the settings for the track's audio mode and the channel's + button provide, of course, no function regardless of their setting.

If the audio clip in the timeline is in stereo and the audio track is configured to mono, the clip will be downmixed by the CLIP-STER. On all selected channels you will receive the same signal

Audio Clip	Audio Track	Output	
		Channel A	Channel B
Stereo	Mono	Mono of stereo clip	Mono of stereo clip

If the audio clip in the timeline is in stereo and the audio track is configured to stereo, the output will depend on the state of the **+** button, i.e. whether the channels are configured as stereo or mono channels: When the channels are set to mono, a mono signal of the downmixed stereo clip will be provided. If the channels are set to stereo, a standard stereo signal will be output.

Audio Clip	Audio Track	Output		
		+ Button	Channel A	Channel B
Stereo	Stereo	Mono (button deactivated)	Mono of stereo clip	Mono of stereo clip
Stereo	Stereo	Stereo (button activated)	Channel 1 (left) of stereo clip	Channel 2 (right) of stereo clip

Once the settings for the respective track are set, confirm and activate them with the button **OK** of the audio track properties window.



The audio at the hardware will be given out via AES/EBU and embedded in the video signal simultaneously.

Via the **SETTINGS...** button in the timeline area (see section "Timeline Configuration" on page 123) you can configure the analog audio outputs and the maximum amount of audio channels that will be embedded in the video signal.

### Further Audio Configurations:

Via the **Settings...** button you can configure the analog audio outputs to monitor audio during your work with the software. It is located at the top left side of the timeline area. After pressing this button the 'TIMELINE OUTPUT SETTINGS' window is displayed.

At the bottom of this window you can find the Options area where further optional settings are provided. To the right you can find the settings items for a further configuration of audio.



Items for a further configuration of audio

In detail this area provides the following items:

**Audio Scrubbing** If this check box is activated, the contents of the audio tracks will be given out during a scrubbing of the CLIPSTER's timeline, for example, when making a fast shuttle operation with the mouse. Then the audio signal resembles and imitates a fast shuttle operation of a VTR.

**MONITORING...**

The button **MONITORING...** configures the analog audio outputs of the DVS system. A click on this button opens the following window: *Analog audio configuration*



*uration*

The settings **Output A** and **Output B** configure the first and second analog monitoring output of the DVS system respectively. Select from the combo boxes the audio channels that should be given out at the respective analog output.

Once everything is set as desired, the audio configuration is complete and you can monitor the audio output as configured via the analog and digital audio outputs of the system.

## Loading and Applying a 3D LUT File

With a three-dimensional look-up table (3D LUT) file you can, for example, simulate the typical look of a projected motion picture film on a monitor connected to the digital video interfaces of the system. The CLIPSTER supports 3D look-up tables from various suppliers, such as ARRI or Kodak. To apply a 3D LUT, you have to load its file first and create a profile for it. Afterwards the loaded 3D LUT file has to be enabled for the DVS software



The 3D LUT support of the R&S DVS software is an optional feature. Depending on the configuration of your system it may not be available.

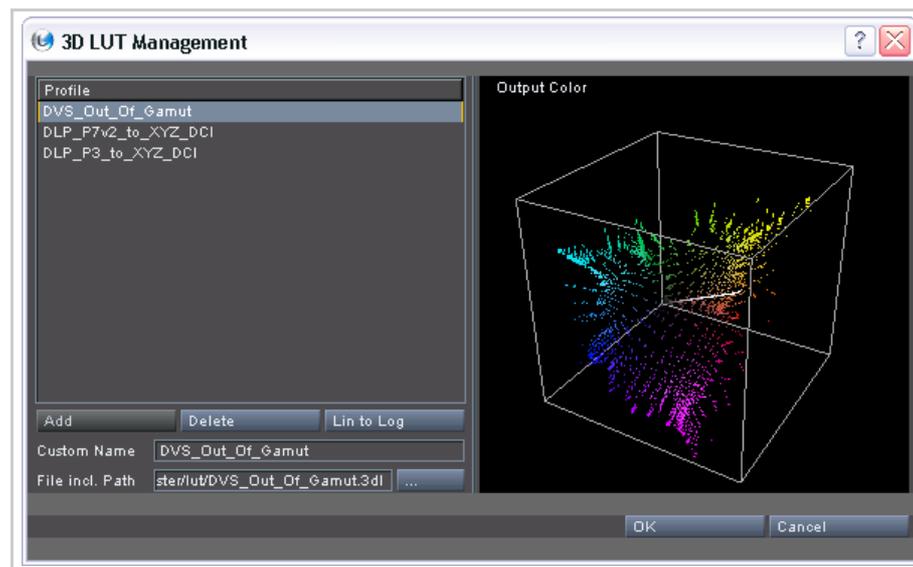
Via the **Settings...** button you can access the items to load a 3D LUT file into the CLIPSTER. It is located at the top left side of the timeline area. After pressing this button the 'TIMELINE OUTPUT SETTINGS' window is displayed.

At the bottom of this window you can find the **OPTIONS** area where further optional settings are provided. To the right you can find the settings items to load a 3D LUT file.



Items to load a 3D LUT file

After clicking on the button **3D LUT...** a window opens to load a 3D LUT file and create a profile for it:



3D LUT file management

To load and administer available 3D LUT files, the window provides the following items:



Several sample LUT files are delivered with the DVS software. They can be found in the directory *lut* of the software's installation path (default: *C:\Program Files (x86)\DVS\Clipster*).

More detailed information about 3D LUT files can be found in section "3D LUT Files" (page 509).

- Profile** In the list box **Profile** you can see a list of the already specified 3D LUT file profiles. Each entry in this box represents one 3D LUT file. Select from this list box one entry, for instance, to change its settings, to delete it or to enable it.
- ADD** Once a valid 3D LUT file is selected and a profile name is specified, you can add it to the list box above with the button **ADD**. Because one 3D LUT file can be applied to one profile only, with this button you can also change the name of an already created profile or assign another file to it.
- DELETE** With the button **DELETE** you can delete an already specified 3D LUT file profile from the list box. Simply select an entry from the list box and press this button to delete it.
- LIN TO LOG** Logarithmic 3D LUTs often expect logarithmic material in the timeline (color values for each image are stored logarithmically). With this button it is possible to virtually convert linear material in the timeline to a logarithmic color space before the 3D LUT is applied.
- Custom Name** In the entry field **Custom Name** you can state the name of a 3D LUT profile. Either enter a new name or select an already created profile in the list box and change its name.
- File incl. Path** In this entry field you have to enter the directory path and file name of the 3D LUT file. You may also click on the button to the right of the entry field (  ) to select the file directly via the opening dialog window.

### 3D LUT Visualization

When a profile is selected from the list box, its 3D LUT file will be displayed in the preview area to the right in a color cube. Then you can view it in more detail by performing one of the following on the color cube:

By pressing the left mouse button and moving the mouse you can rotate the color cube.

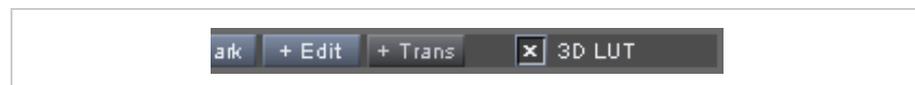
By clicking with the scroll wheel or the right mouse button you can switch the output colors to the input colors and vice versa. The one currently displayed will be indicated at the top of the preview area.

By turning the scroll wheel of the mouse you can morph the colors in the cube from output to input and vice versa. The degree of the morphing will be indicated at the top of the preview area.

Once at least one profile is available in the list box, you can enable it for the CLIPSTER. For this the desired profile name has to be selected from the list box and your selection has to be confirmed with the **OK** button. The button Cancel it will close the window for the 3D LUT management without confirming any of the alterations.

Nevertheless, the selected 3D LUT profile and file will be in effect for the timeline only if the check box **Video-3D LUT** is activated which is available in the **OPTIONS** area of the 'TIMELINE OUTPUT SETTINGS' window.

When the selected profile and its 3D LUT file will be applied to the material in the timeline of the Edit Tool. This check box, however, is connected to the 3D LUT check box in the timeline area:



Toggle 3D LUT on or off from the timeline area

It performs the exact same function and you can use it to toggle the effect of the 3D LUT on and off directly from the timeline area.

## Cropping the Timeline

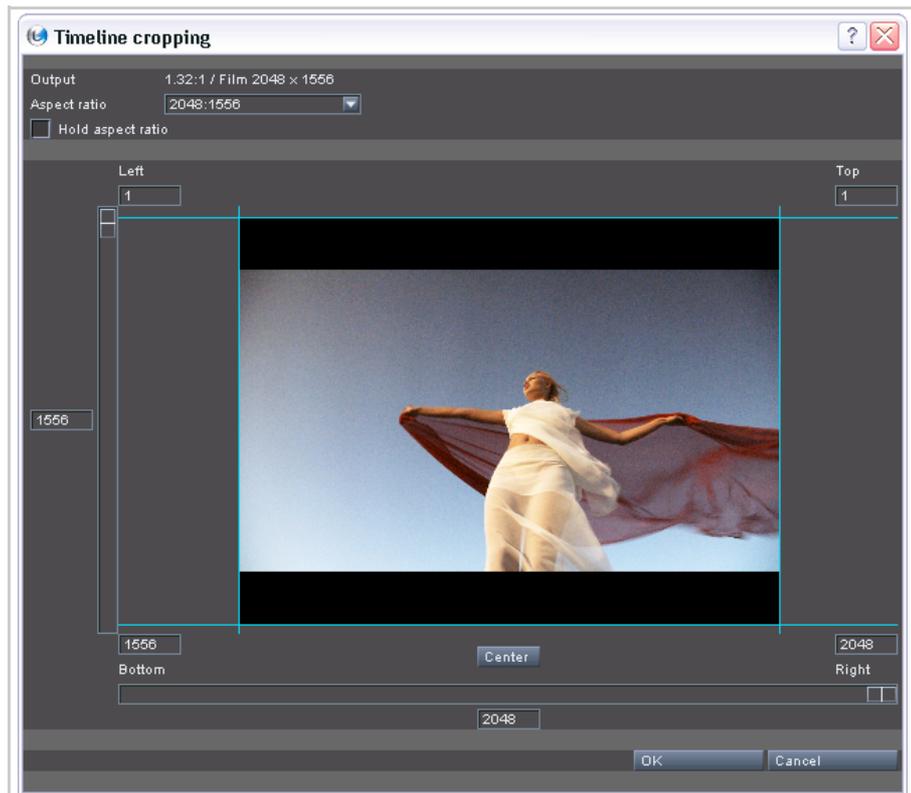
Via the **Settings...** button you can crop the contents of the timeline, for example, if you need black bars in the video output (letter- or pillarboxing). The button is located at the top left side of the timeline area and after pressing it the 'TIMELINE OUTPUT SETTINGS' window is displayed on the screen.

At the bottom of this window you can find further optional settings in the **OPTIONS** area. To the right you can find the settings to crop the video output.



Items to crop the timeline

With these items you can adjust and crop the output image, for example, to add black bars to your video output. A click on the button **Cropping...** opens the following settings window:



Window to crop the video output



During configuring, the cropping will appear in the video overlay and at the video output of the system. However, this is temporary and for monitoring reasons only. To apply the settings to the timeline, the cropping has to be activated with the check box **Video-Cropping** in the **Options** area of the **'Timeline output settings'** window.

At the top of the **'Timeline cropping'** window you can find items to control the aspect ratio of the cropped image.



Aspect ratio controls

The **Output** information at the top provides you with details about the currently set video format and its aspect ratio. Directly below it you can find the **Aspect ratio** combo box where you can either select one of the predefined aspect ratios from the provided list or simply enter the desired ratio in the field of the combo box directly. You can enter the aspect ratio in any format you like either by typing in a floating point number or its original division formula. The cropping will be applied to the video output representation, the video overlay as well as to the video output directly as soon as a predefined aspect ratio is selected or a typed in value is confirmed by pressing the [Enter] key.

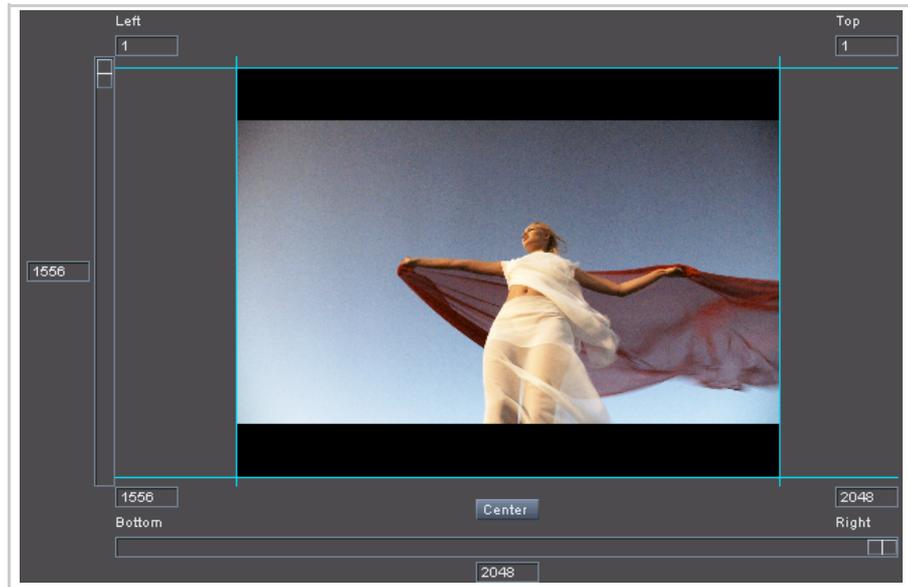
Notation: Floating point or division (x:y)

Examples: 1.77777778

16:9

With the **Hold aspect ratio** check box you can lock the aspect ratio selected with the combo box above. Then, when changes are applied manually to the cropping (e.g. via the entry fields or the sliders), the chosen aspect ratio will be maintained.

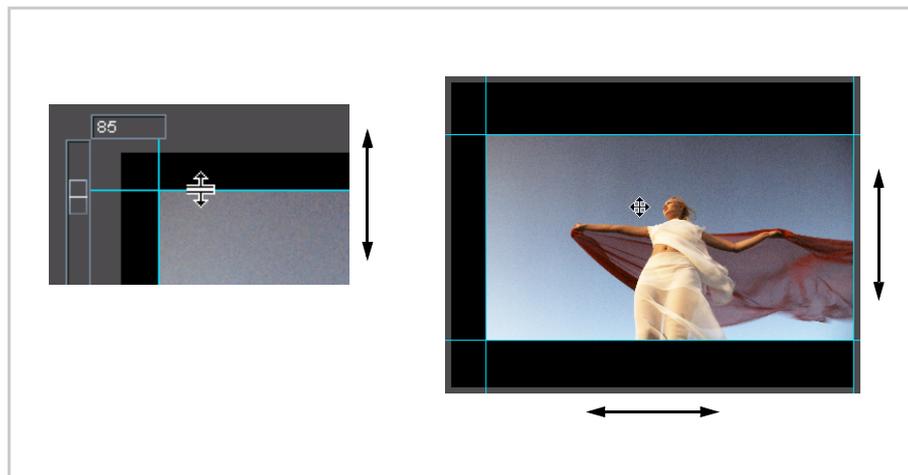
In the middle of the window you can find a representation of your current video output. With the items provided by and positioned around the image you can change the cropping manually:



Manual controls of cropping

To change the cropping manually, use, for example, the entry fields and type in the desired values (in pixels). The cropping will be applied to the representation as well as to your video output as soon as a value is confirmed by pressing the [Enter] key.

You may also use the sliders at the bottom and to the left to change the cropping. Furthermore, you can select the cropping borders as well as the cropped image to adjust the cropping manually. The sliders as well as the entry fields and, if applicable, the aspect ratio will be altered accordingly:



Adjusting the cropping manually with the mouse

The button **Center** is a toggle button. Once activated, the cropped image will be centered in the representation and locked there. With this, when changes are applied to the cropping, the cropped part will always stay in the middle of the image.

Once everything is set as desired, confirm your selection with the **OK** button at the bottom of the 'TIMELINE CROPPING' window. The button **Cancel** will close the window for the cropping settings without confirming any of the alterations.

However, the cropping will be in effect for the timeline only if the check box **Video-Cropping** in the **OPTIONS** area of the 'TIMELINE OUTPUT SETTINGS' window is activated:



Activation of the cropping of the timeline

The color value of the black bars added to the timeline via cropping and played out via the system depends on the setting for the color space range specified in the video output settings. Via the color space range settings you determine whether this value is given out in a restricted (e.g. with a value of **16**, setting: **Head**) or in a full value range (with a value of **0**, setting: **Full**).

## Applying an ASC CDL

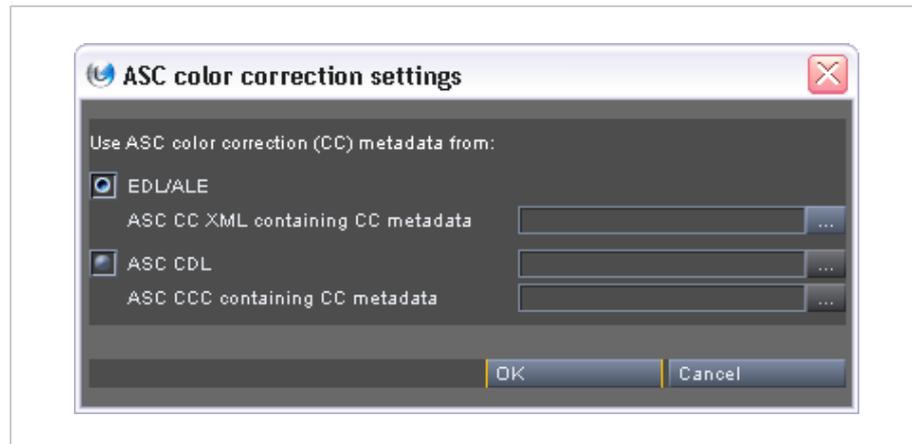
Via the **Settings...** button you can apply a color correction via an ASC CDL to the clips in the timeline. The button is located at the top left side of the timeline area and after pressing it the 'TIMELINE OUTPUT SETTINGS' window is displayed on the screen.

At the bottom of this window you can find further optional settings in the **OPTIONS** area. To the right you can find the settings to apply an ASC CDL.



Items to apply an ASC CDL

Click on the button **ASC CC...** to open the following settings window:



Settings for an ASC color correction

In this window you have to specify the source of the color correction information:

Source	Radio Button	Further Setting
In EDL/ALE directly	<b>EDL/ALE</b>	No other setting required. Data import directly via Conforming Tool, see "Conforming Tool" (page 461)
In EDL/ALE referencing to an ASC file	<b>EDL/ALE</b>	Specify location and file name with the entry field (*.cdl or *.ccc)
In separate ASC CDL	<b>ASC CDL</b>	Specify location and file name with the entry field to the right (*.cdl)
In separate ASC CDL referencing to an ASC CCC	<b>ASC CDL</b>	Specify location and file name of the CDL file with the entry field to the right (*.cdl) and of the CCC file with the entry field at the bottom (*.ccc)

Once everything is set as desired, confirm your settings with the **OK** button.

However, the color correction will be applied to the timeline only if the check box **ASC Color Correction** in the Options area of the 'TIMELINE OUTPUT SETTINGS' window is activated:

Then for each clip detailed in the source that can be found on the timeline as well, a primary color correction operator will be set that applies the respective color correction.

When working with a lot of timeline tracks, each can be given a name of its own to distinguish between them more easily. For this simply type in in the entry field right above the buttons a name. You can give track names to all tracks available in the timeline area:



Track names

Due to the fact that the area preceding each track will always be visible in the timeline area of the CLIPSTER, it may help you to identify individual tracks more easily.



## Controlling the Timeline

Most work is performed in the timeline of the Edit Tool directly. In the timeline you can arrange the sequence of video clips, cut the material or set transitions and other operators for the clips. Furthermore, you can play out the timeline, either the whole timeline or a defined range of the timeline.

This section explains in detail how to control the timeline. Among others it will be explained how to move within the timeline and how to set an in- and outpoint for the timeline to play out the selected range only.

The following topics are covered:

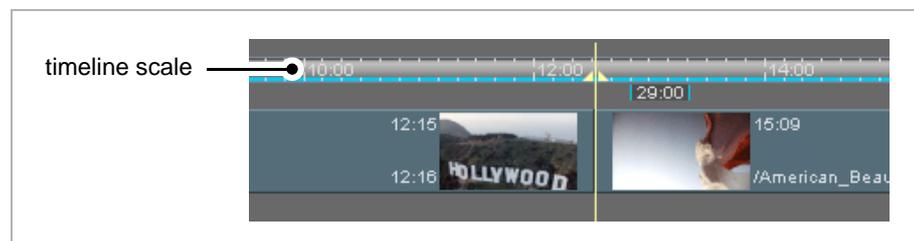
- Moving within the Timeline (page 144)
- Setting an In- and Outpoint for the Timeline (page 147)
- Insert/Overwrite Mode of the Timeline (page 149)
- Muting and Locking Tracks (page 151)

### Moving within the Timeline

The Edit Tool provides two representations of the timeline in its user interface: There is the timeline with timeline scale and video tracks in the timeline area, and there is a scrub bar of the timeline in the control area of the Edit Tool. Both can be used to move within your project. Nevertheless, other functions and items to move inside the timeline are provided by the Edit Tool as well.

#### Moving via the Timeline Scale

With the timeline scale you can move within your project and position the timeline cursor.



Timeline scale

To move within your project, click on a point in the scale and the timeline cursor will be positioned there. Additionally, by selecting the cursor and moving it to the left or right you can scrub the visible part of the timeline.

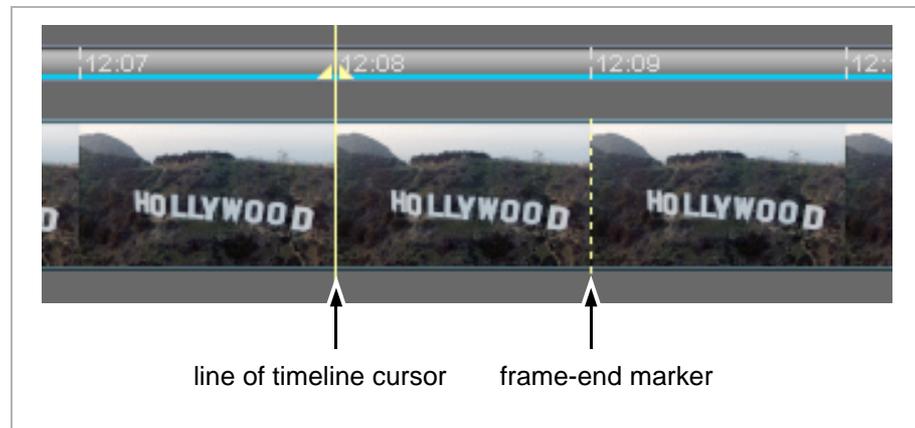
This part of the timeline together with the video tracks can be scaled from a full view of the timeline to a partial view that consists of a few frames only. Via the sliders below in the timeline area you can change the view of the timeline and thus move easily within your project.



With the left slider you can zoom in or out of the timeline (keyboard shortcuts [Up Arrow] and [Down Arrow]). If the slider is set to the leftmost point, you are able to see the whole contents of the timeline. When it is set more to the right, you will zoom into the timeline.

When you have zoomed into the timeline, you can change the viewing position of the timeline with the right slider. You can go to the end of the timeline by pulling this slider to the right, and to the beginning of the timeline by pulling it to the left.

The cursor of the timeline provides a special feature when zoomed far into the timeline: Then it provides a frame-end marker which indicates where this particular image ends in the timeline.



Timeline cursor when zoomed into the timeline

As you can see in the figure above the frame selected with the cursor is the 8th frame of the 12th second and it ends where the 9th frame starts. The frame-end marker is very useful when you want to perform frame accurate cuts or other edit works.

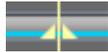


### Moving via the Scrub Bar of the Control Area

In contrast to the timeline of the timeline area the scrub bar of the control area always shows the complete timeline of the loaded project. It can also be used to move within your project.

Perform the following steps:

1. Select the scrub bar cursor with the mouse and move it to the left or right to the desired position.



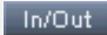
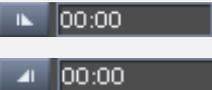
2. Click anywhere below or above the scrub bar to position the scrub bar cursor there instantly.
3. Click on a position on the scrub bar outside the visible part of the timeline to move the scrub bar cursor there instantly.
4. You can also move the visible part of the timeline on the scrub bar to the left or right with the mouse to select another part of the timeline in the timeline area for viewing.

In addition to the controls of the user interface, there are a lot of keyboard shortcuts available. These complement the controls (some of them even do not have a control element in the user interface) and you can use them for a faster working with the software. A list of all keyboard shortcuts can be found in "Keyboard Shortcuts" (page 486).

## Setting an In- and Outpoint for the Timeline

With the button to the left of the button Delete displaying In/Out you can set an in- and outpoint for the timeline. A playout or finalizing (if set accordingly) will then be performed in the defined range between in- and outpoint only.

### UI Elements

Item	Description
	When this button is labeled <b>In/Out</b> , you can set the timeline's in- and outpoint.
	The <b>Delete</b> button is a toggle button. If it is activated, you can delete the in- and/or outpoint by clicking the inpoint, outpoint or duration button. Regardless of the position of the timeline cursor the in-/outpoint will be deleted. If the <b>Delete</b> button is deactivated, a click on the in-/outpoint/duration button will set the inpoint or outpoint respectively
	To position the in- and outpoint frame accurately, you may use the in- and outpoint entry fields. Simply type in the entry fields the position of the in-/outpoint that should be set. Then press [Enter] to confirm it. The in- or outpoint will be set accordingly. Further information about timecode and frame number entry fields can be found in section section "Timecode / Frame Numbers Fields" on page 30.
	The inpoint button sets or deletes the inpoint of the timeline depending on the state of the Delete button. When setting, the inpoint will be set at the position of the timeline cursor.
	Same as the inpoint button but sets or deletes the outpoint.
	When an inpoint is set, you can use this entry field to specify the duration for the timeline. The outpoint will be set accordingly.
	This button will be available when the <b>Delete</b> button is activated. Then it will delete both the in- and outpoint simultaneously.



## Setting an In-/Outpoint

Perform the following steps:

1. Move the timeline cursor via its controls or manually to the position where the in-/outpoint must be set.



An in-/outpoint can only be defined once. If you set it anew, the previous one will be replaced.

To set an in- or outpoint, you may also use the entry fields to the right of the buttons.

2. Press the in- or outpoint button.



- ▶ The in-/outpoint will be set at this position. The still selected part of the timeline will be displayed as usual whereas the deselected part is shown in a dimmed fashion in the video and audio tracks. Furthermore, in the timeline scale the selected part of the timeline will be marked with a blue line.



With a set in- and outpoint a playout of the timeline will then be performed between in- and outpoint only if set accordingly via the Configuration Tool.

## Deleting an In-/Outpoint

Perform the following steps:

1. Press the button **Delete** to activate the deletion mode for the in- and outpoint.
2. Click the in-/outpoint button or the duration button to delete both simultaneously.

The in-/outpoint will be deleted. If both are deleted, the whole timeline will be available again for playout.

## Insert/Overwrite Mode of the Timeline

The Insert button toggles between the insert and overwrite mode of the CLIPSTER.

**Insert Mode** In the insert mode, a moved or added clip is inserted between the video material already present in the timeline. The video material behind the insertion point is moved backward from its position on the timeline. In the insert mode no video material will be overwritten and intact (undivided) clips will be divided at the insertion point.

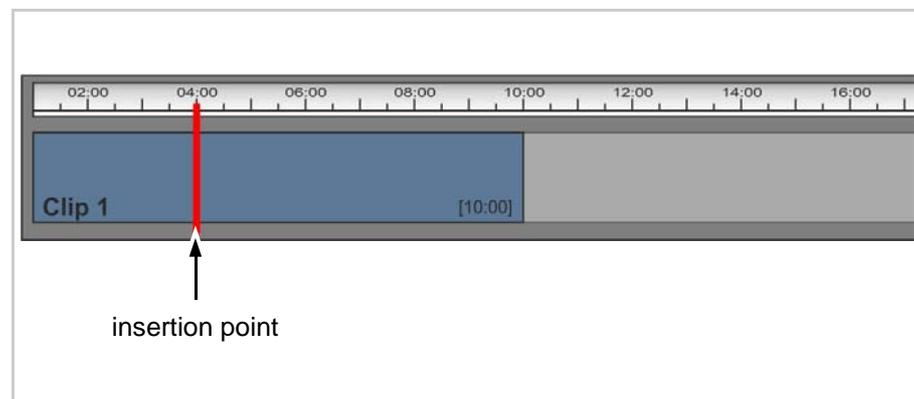


To set a transition in the insert mode, there must be enough head and tail available, otherwise the **TRANS** button will not be available. For more information about transitions see "Setting Transitions" (page 159).

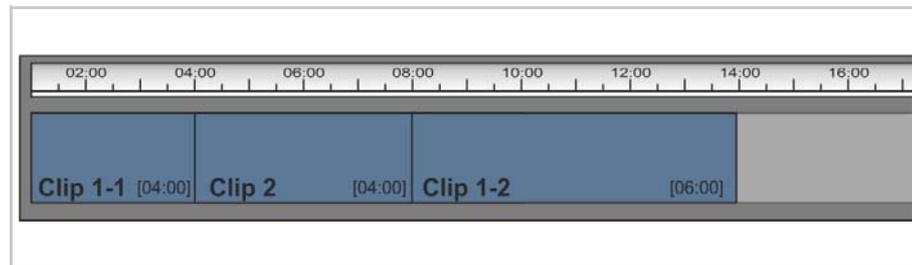
When working with attached clips in the timeline, the overwrite mode is activated automatically. Then you cannot switch to the insert mode anymore. Further information about this and the attachment of clips can be found in "Attaching Audio Clips to Video Clips" (page 175).

### Example:

With the insert mode activated add a clip from the bin to the timeline or move a clip to the middle of an intact clip:



The result will be that clip no. 1 gets divided at the insertion point: The added clip no. 2 will be placed here while the rest of clip no. 1 moves to the end of clip no. 2:



The gist of the insert mode is that the contents of the timeline will be preserved at all times and that no clips will be deleted. Furthermore, during your editing work the clips will always stay in connection with previous or following clips so that no gaps will occur in the timeline.

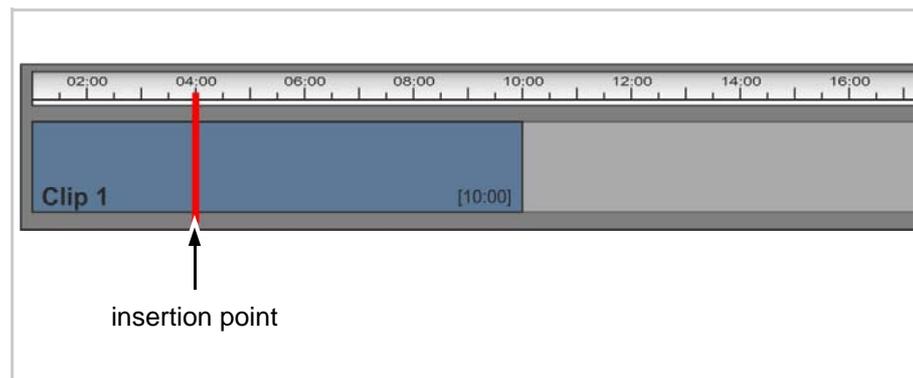
**Overwrite Mode**

In the overwrite mode a moved or added clip replaces the video material behind the insertion point.

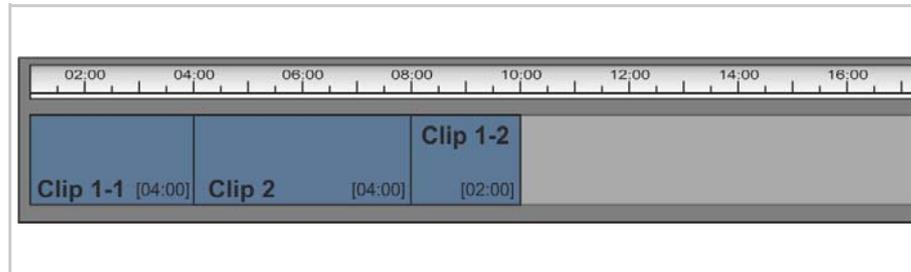
In the overwrite mode you can set a transition between two neighboring clips at all times. If needed, the Edit Tool will create the necessary head and tail automatically. This means that parts of the clips may be moved to enable the transition which, in turn, may cause gaps in the timeline. For more information about transitions see "Setting Transitions" (page 159).

**Example:**

With the overwrite mode activated add a clip from the bin to the timeline or move a clip to the middle of an intact clip:



The result will be that clip no. 1 gets divided at the insertion point: The added clip no. 2 will be placed here while the rest of clip no. 1 is overwritten.

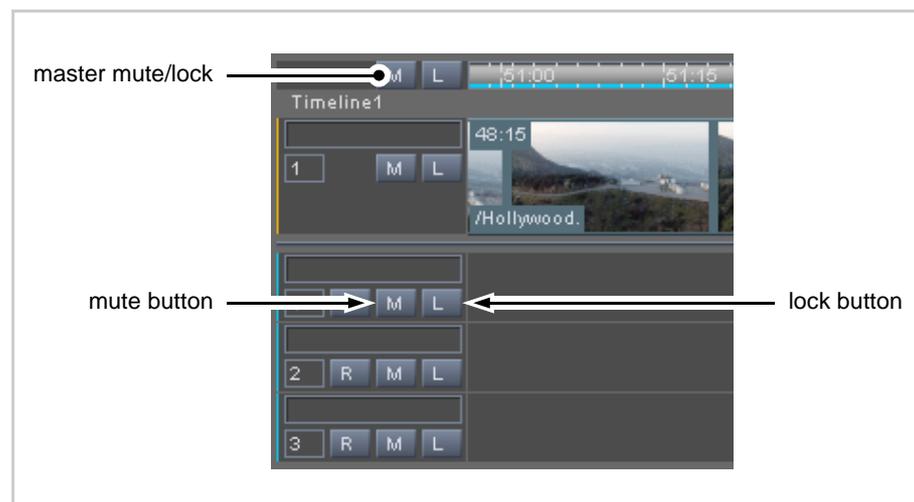


When moving or adding clips in the timeline with the overwrite mode activated, gaps may occur in the timeline. Further information about gaps and how to close them can be found in "Moving within the Timeline" (page 144).

## Muting and Locking Tracks

The video and audio tracks of the CLIPSTER can be muted and/or locked independently, i.e. they can be enabled or disabled for a playout as well as for an editing work. If a track is muted, its content will not be played out; if it is locked, no editing work, such as a cutting of clips, can be performed in this track.

To lock or mute a track, you have to use the buttons available in the areas right in front of the tracks. The button **M** mutes the track (bar it from an output), while the button **L** locks it (bar it from an editing work):





With the **M** and **L** buttons to the left side of the timeline scale you can mute and lock all video and audio tracks with one click (master mute/lock). Afterwards you may use the mute and lock buttons of individual tracks to enable them for the respective work again. This may be especially useful when working with a lot of tracks.

When locking tracks and thus preserving them from changes, the locked tracks will appear dimmed in the timeline area.

## Working with the Timeline

After adding clips to the timeline, you can begin your editing work such as altering the sequence of clips, cutting clips or defining transition.

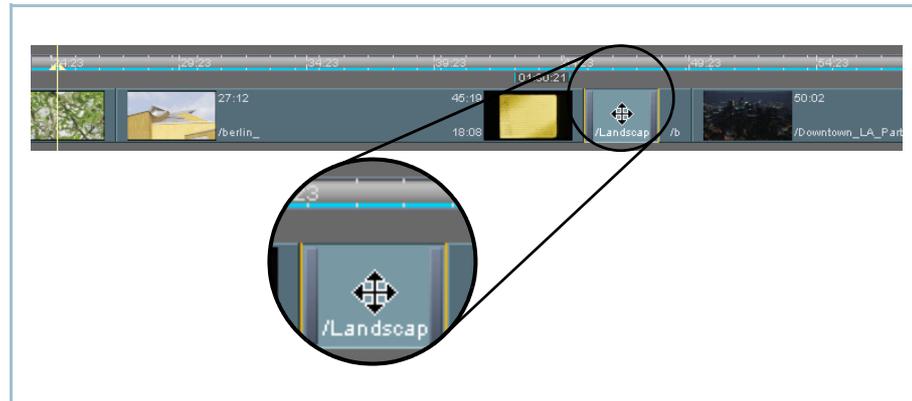
You can use the video overlay of the CLIPSTER to monitor and check the progress of your work. Most of the time the editing work and its output effect can be seen in the video overlay instantly. For example, clips of different sizes in the video track(s) of the timeline may be cropped, stretched or compressed, or scaled according to your settings for the respective clips and your output settings. All these effects can be viewed instantaneously via the video overlay of the control area

The following topics are covered:

- Moving Clips within the Timeline (page 153)
- Selecting Clips (page 155)
- Adding Clips of a Certain Length to the Timeline (page 156)
- Deleting Timeline Elements in a Specified Range (page 157)
- Performing a Cut (page 158)
- Setting Transitions (page 159)
- Prerendering of Timeline Elements (page 160)
- Changing In- and Outpoints of Timeline Elements (page 162)
- Advanced Trimming (page 165)
- Understanding Markers (page 167)
- Marking Positions in the Timeline (page 173)
- Attaching Audio Clips to Video Clips (page 175)
- Time Stretching or Time Compression of Video Clips (page 177)
- Relinking Clips (page 179)

### Moving Clips within the Timeline

To arrange the clips in the desired sequence on the timeline as they should be played out in the end, you may have to move clips within the timeline which is very easy with the Edit Tool. Simply select a clip and drag it with the mouse to the desired position on the timeline.



Moving a clip

With the insert mode activated, if a clip is moved to a cutting point, the clip will be inserted there while the rest of the material moves backwards in the timeline. If it is dropped in the middle of another clip, this clip will be divided and its rest as well as the rest of the track's contents will be moved to the end of the inserted clip.



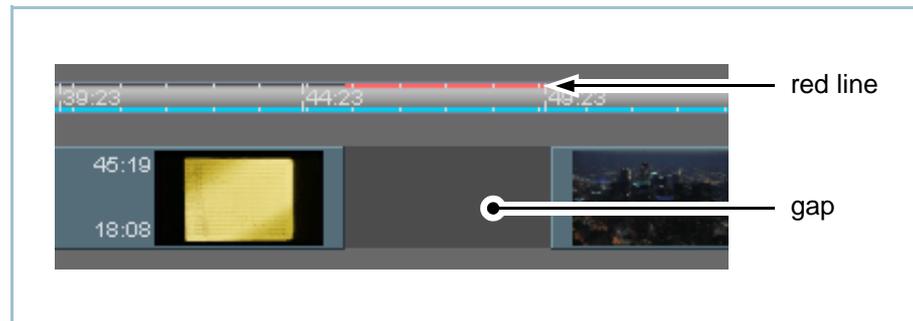
This behavior depends on the selected mode of the timeline. With the overwrite mode activated, the moved clip will overwrite the contents of the track from the point of the insertion on, see also "Insert/Overwrite Mode of the Timeline" (page 149).

When the moved clip comes close to certain elements of the timeline, it will automatically snap and position itself to these elements. This is called the snapping mode of the CLIPSTER. It makes an easy positioning of elements possible. The moved clip will react to the following elements:

- Starting point of timeline
- Start and end points of timeline elements (e.g. clips and transitions)
- The position of the timeline cursor
- Set in- and outpoint of the timeline

You can disable the snapping mode and activate a fine tuning mode by pressing the [Shift] key.

In the overwrite mode when moving clips or performing other work, gaps may occur in the timeline. A gap means that a clip is no longer in connection with previous or following clips in the timeline. When neither audio nor video is available to output in this part of the timeline, the gap will also be marked with a red line in the timeline scale:



A gap in the timeline

To resolve a gap that is present in the timeline, you either have to move the clips accordingly or fill the gap by adding another clip.

Additionally, when a red line is shown, you have the possibility at hand to close the gap automatically: When positioning the mouse cursor over the red line of the timeline scale it will change its appearance to a hand and you can close it with a double-click of the mouse.



The starting point of a gap as well as its end are recognized by the Edit Tool as cutting points. Thus, you can move frame accurately to gaps easily via the control buttons that jump to cutting points.

## Selecting Clips

Clips can be selected or deselected in the timeline easily. For this perform one of the following procedures or their combination.



Although the table below describes how to select clips only, most procedures can be used to deselect clips as well.

Some of the following procedures are restricted to their type of track, i.e. restricted to either video or audio tracks.

### Individual clips

Individual clips can be selected with a click of the mouse on the respective clip.

### Several clips

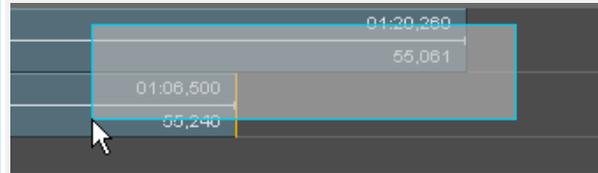
Several clips can be selected disjointedly when clicking them while holding down the [Ctrl] key at the same time.



### Range of clips

A range of adjoining clips can be selected by clicking one clip (the starting clip) and afterwards holding down the [Shift] key while clicking the clip that marks the end of the range.

**You can also select a range of clips by drawing a rectangle with the mouse over the clips that you want to select. The starting point of the rectangle has to be on an empty part of the timeline track**



### All clips

All clips in the timeline area can be selected in one step by using the menu option **Select all** of a timeline track's context menu.



Bin clips and timeline elements can be cut or copied to the clipboard of the operating system and afterwards pasted again at the location of your choice.

## Adding Clips of a Certain Length to the Timeline

If you want to fill a gap in the timeline or fill a particular part of the timeline with other video or audio material, you can add a clip to the timeline with the help of the timeline's in- and outpoint (3-point and 4-point editing). This will then fill the selected, particular part of the timeline.

Perform the following steps:

1. Set the inpoint of the timeline at the position where the clip to be added should start.
2. Set the outpoint of the timeline at the position where the clip to be added should end.

3. Prepare the clip to be added to the timeline as indicated in "Adding Clips to the Timeline" (page 118), for example, by determining its in- and outpoint.



When adding a clip via the source-edit mode of the control area, you do not have to define an outpoint for the clip necessarily. The clip will be cut to its correct length automatically due to the set outpoint in the timeline.



For the next step you have to observe the insert/overwrite mode: In the insert mode the contents of the timeline as it is will be preserved and moved backwards in the timeline while in the overwrite mode it will be overwritten, see also Insert/Overwrite Mode of the Timeline (page 149).

4. Add the clip to the timeline as described in "Adding Clips to the Timeline" and drag it to the set inpoint of the timeline.

With the snapping mode active the clip will adjust itself automatically at the inpoint of the timeline when the mouse cursor is in close proximity to it. After releasing the mouse button the clip will be added to the timeline at the exact position. Furthermore, if its length exceeds the length of the marked part of the timeline via in- and outpoint, it will be trimmed to the exact length determined by the outpoint of the timeline automatically.

## Deleting Timeline Elements in a Specified Range

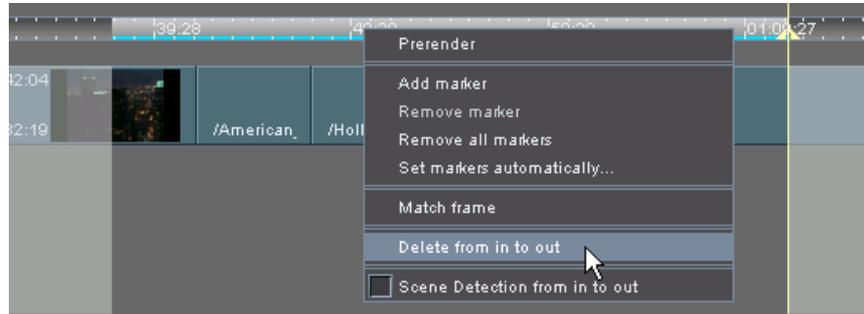
You can delete all timeline elements in a specified range of the timeline easily. To determine the range and part of the timeline where the deletion should occur, you have to use the timeline's in- and outpoint. Afterwards all timeline elements between the in- and outpoint of the timeline can be deleted.

Perform the following steps:

1. Set the inpoint of the timeline at the position where the range should begin, see "Setting an In- and Outpoint for the Timeline" (page 147).
2. Set the outpoint of the timeline at the position where the range should end, see "Setting an In- and Outpoint for the Timeline" (page 147).
  - ▶ Now you are able to delete the timeline elements:



3. Call up the context menu of the timeline scale and select the menu option **Delete from in to out:**



The menu option **Delete from in to out** will be available as soon as an in- and outpoint of the timeline are set.

This will delete all timeline elements between the in- and outpoint of the timeline. If appropriate, the elements will be cut at the position of the in-/outpoint. Whether a gap occurs in this part of the timeline or the rest of the timeline is moved to the left to stay in direct connection with all previous timeline elements depends on the insert/overwrite mode of the timeline area. When a track is locked, its timeline elements are not deleted.

## Performing a Cut

Once at least one clip is present in the video or audio tracks of the timeline, you can cut the clip at a desired position.

Perform the following steps:

1. Move the timeline cursor to the desired position in the timeline.



When zoomed far into the timeline, the timeline cursor provides a frame-end marker that indicates where the selected frame ends in the timeline. This may help you during the positioning of the timeline cursor.

2. Press the button **+ EDIT**



The length of a timeline element, i.e. its outpoint, can also be adjusted frame accurately with its timeline element properties.

This will cut the clip and set a cutting/edit point at the selected position. Then you can, for example, delete one of these clips (select the clip and press the [Del] key on your keyboard), move it to another position or alter its properties differently. When a track is locked, its timeline element is not cut.

## Setting Transitions

When at least two clips are present in a video track of the timeline you can set a transition between these two clips. After the setting of a transition you can change its properties or, if applicable, prerender the transition. This section describes in the following the necessary procedures to apply transitions to cutting points on the timeline.

Perform the following steps:

1. Move the timeline cursor to the cutting point between the two clips with the respective controls, see also "Moving within the Timeline" (page 144). If you activate the trim mode, the CLIP-STER will automatically jump to the nearest cutting point.
  - ▶ This will make the button **TRANS** available in the user interface.



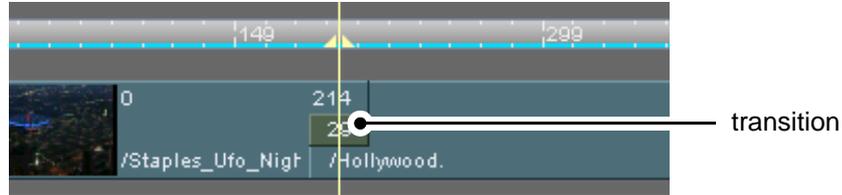
To set a transition, there must be enough head and/or tail available of at least one clip to make a blending possible, otherwise the button **TRANS** will be unavailable. You can create the necessary head and tail manually by adjusting the in- and outpoint of clips.

If you are in the overwrite mode of the timeline, the CLIP-STER will create the head and tail for the transition automatically. This means that parts of the clips will be moved for the transition. Due to the moving of the clips the creation of a transition in the overwrite mode may cause gaps in the timeline.



## 2. Select the button **TRANS.**

- ▶ A transition appears between the two clips (by default set to a 'Crossfade' wipe):



- ▶ The exact position of the transition depends on the available head and tail. If head and tail are sufficiently available for both clips, the transition will be positioned exactly in the middle of the timeline cursor.



You can delete a transition the same way you delete a clip from the timeline. Simply select its visual representation in the timeline and press the key [Del] on your keyboard or select from its context menu the menu option **De-lete**. Depending on the resolution of the material and the type of operators used in the timeline, it may be necessary to prerender the transition.

The exact position of the transition depends on the available head and tail. If head and tail are sufficiently available for both clips, the transition will be positioned exactly in the middle of the timeline cursor.

The transition is now added to the timeline and you can proceed, for instance, by calling up its properties and altering them to adjust the transition to your needs. How to do this and the individual items available to change a transition are described in

## Prerendering of Timeline Elements

When adding timeline elements, such as clips or operators, to the timeline, they are immediately tested for their real-time capability which depends on various factors, such as frame size, playout frequency, location of the clip on the storage, etc. Those elements that exceed the real-time capability of the DVS system will be subject to a prerendering. Fact is, the greater the resolution of the material in the timeline and/or the video raster set for an output the more likely the chance that a prerendering is required. Then the system will not be able to handle the respective clip or operator in real time.



A prerendering may be indicated for all types of timeline elements, i.e. clips as well as operators (e.g. transitions). If any exceed the real-time capability of the system, they will be marked for prerendering.

A prerendering of timeline elements means that the Edit Tool calculates the elements before a playout takes place and stores the calculated extra files (rendered images) in a temporary location on the storage. These are then used for a playout instead of the original material in the timeline



It is best to handle and administer the temporary data project specific, meaning for each project in a different temporary storage location, see also section “Notes on Project Management” on page 24

A part of the timeline that has to be prerendered before a playout will be displayed with a yellow line in the timeline scale:



Depending on the optional features and the hardware equipment available, your system may still be able to handle elements that are marked to be prerendered in real time. However, if non-real-time capable material is played out, frames will be dropped (see section “Performance Monitor” on page 69). With operators that are not real-time capable, the system will simply not apply them. In both cases the material has to be prerendered prior to a playout.

Whether the software marks a timeline element to be prerendered, can be determined with a setting in the Configuration Tool.



Timeline element marked for prerendering



Additionally, video clips that are subject to a prerendering will be marked in the timeline with colors:

yellow	The clip has to be prerendered (see figure above).
purple	The clip is currently prerendered. Its progress can be seen in the job list.
blue	The clip is already prerendered.

With a double-click of the mouse on the timeline scale below the yellow line you can start the prerendering process. Alternatively, you can use the menu option **Prerender** on the context menu of the timeline element. The progress of the rendering can be seen in the job list of the tab **Jobs**.

You can delete prerendered data, for example, if it is no longer required, with the menu option **Delete prerendering** on the context menu of a video clip.



After a prerendering save your project file. If an already saved project file is not saved after a prerendering process again, the prerendered files will not be recognized by the Edit Tool when the project file is loaded once more: They will not be used for a playout and have to be deleted manually.

## Changing In- and Outpoints of Timeline Elements

Usually, before a clip is added to the timeline you may adjust its in- and outpoint via the source-edit mode bin of the Edit Tool. However, after clips or other timeline elements are added to the timeline you still have the possibility to change their in- and outpoints.

There are two ways to change the in- and outpoints of timeline elements already added to the timeline:

- Changing the in- and outpoint of adjacent clips to a cutting point via the trim mode of the Edit Tool, or
- Changing the in- and outpoints manually in the timeline track directly.

### Changing In-/Outpoints with the Trim Mode

With the trim mode of the Edit Tool you can change the in- and outpoint of adjacent video clips to a cutting point. You can activate the trim mode with its button from the controls of the Edit Tool (see section “Controls” on page 96).

When the trim mode is activated, the Edit Tool will automatically jump to the nearest cutting point in the video track(s) and the timeline cursor will be positioned accordingly. Furthermore, the control area then displays two video overlays. The left one shows the last frame of the clip left to the cut while the right one displays the inpoint and first frame of the clip to the right. You can then use the trim mode to change the in- and outpoint easily

Select the in-/outpoint handler in the scrub bar below each video overlay with the mouse and move it to the desired position for the respective clip



For a frame accurate trimming you may also use the controls below the two overlays.

You cannot change the in-/outpoint beyond the limits of the original material on the storage.

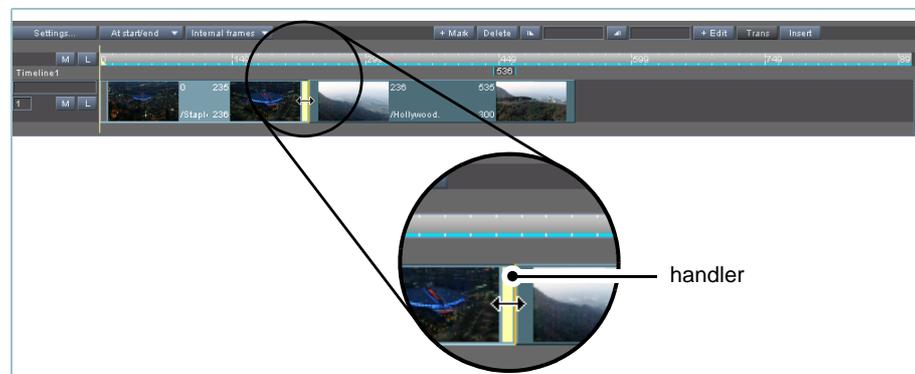
Your alterations will be effective immediately in the timeline. After changing the settings of the handlers you can, for example, define a transition between the clips or perform a playout.

### Changing In-/Outpoints in the Timeline

You can change in- and outpoints of timeline elements, such as a video clip already added to the timeline. Select from the clip’s representation its in- or outpoint handler and move it to the right or to the left to extend or reduce the clip’s length in the timeline



You cannot change in- and outpoints beyond the limits of the original material on the storage.

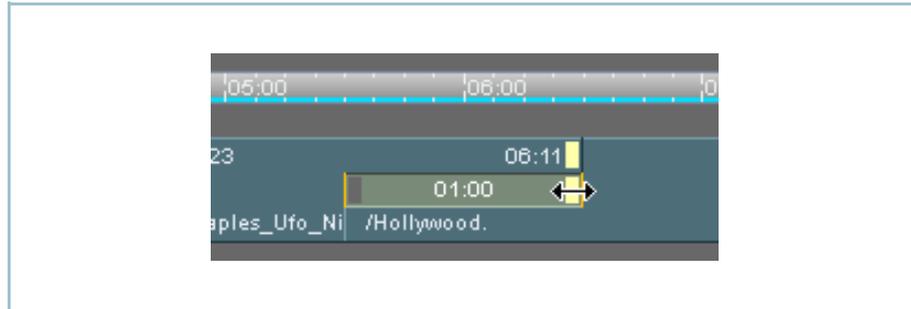


Changing of in- or outpoint



This will change the in- or outpoint of the clip accordingly.

This procedure can be used for all timeline elements, i.e. video clips, audio clips and embedded operators (e.g. transitions). To adjust their length in the timeline, simply select their in-/outpoint handler and move it to the right or left of the timeline. The following figure shows, for example, how to change the length of a transition:



Changing the length of a transition

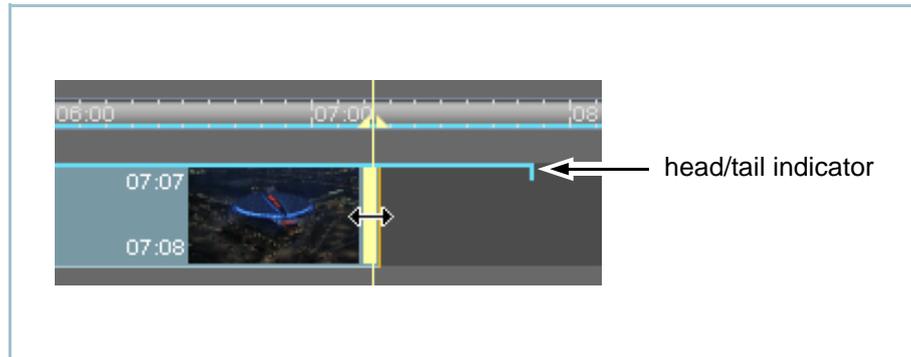


The length of a timeline element, i.e. its outpoint, can also be adjusted frame accurately with its timeline element properties.

As long as the insert mode of the Edit Tool is active, the subsequent clips and embedded operators will automatically adjust their positions on the timeline respectively. When the Edit Tool is set to the overwrite mode, gaps may occur in the timeline.

The in- or outpoint handler will react to certain elements of the timeline (snapping mode) to allow for an automated positioning. You can deactivate the snapping mode and activate a fine tuning mode by pressing the [Shift] key.

During the positioning of the in- or outpoint handler of clips you can see a representation of the length of the clip in its timeline track. The blue line right above the clip shows its original length:

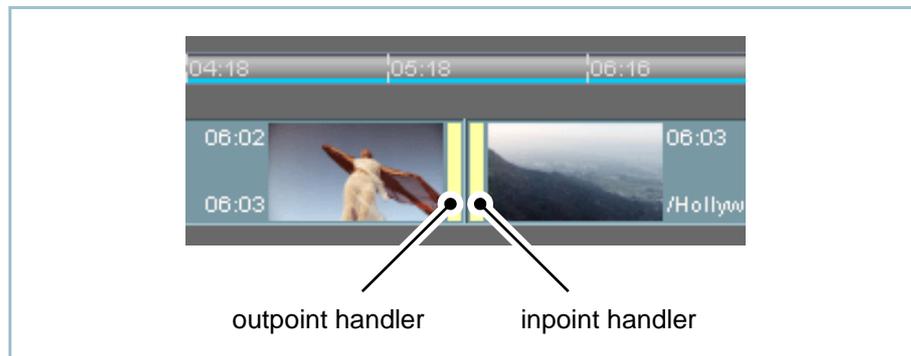


Display of original length of a clip

With this you can easily determine whether and how much head or tail is available to, for example, create a transition.

## Advanced Trimming

The advanced trimming features of the CLIPSTER are available when selecting two or more in- or outpoint handlers of timeline elements present in the timeline.



To select more than one handler, hold down the [Ctrl] key while clicking on another handler with the mouse. After that you can click on one of the handlers and drag it to another position. The rest of the selected handlers will act accordingly.



To trim several in- or outpoint handlers, there must be enough head and tail available for all selected timeline elements, otherwise a trimming will not be possible.

If you select the outpoint handler of one clip and the inpoint handler of the neighboring clip to the right, you can extend the length of one clip while shortening the length of the other at the same time. Thus the timeline length will be maintained.



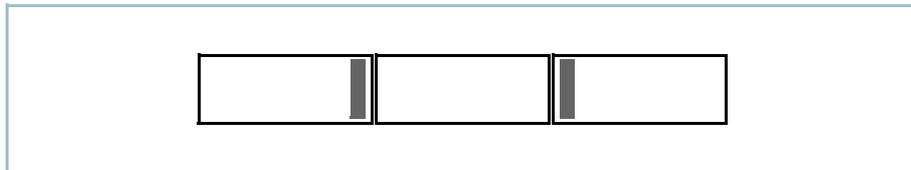
Selected in- and outpoint handlers of neighboring clips

If you select either two outpoint handlers or two inpoint handlers, you can adjust the length of the two clips simultaneously.



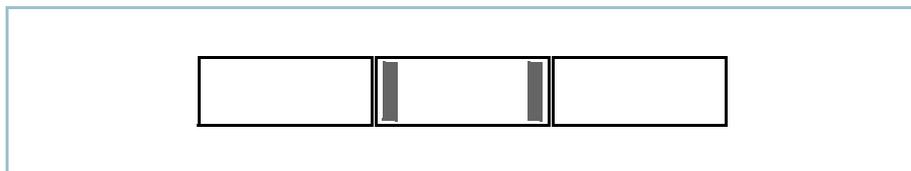
Two selected outpoint handlers

**Slide trimming:** When you select one out- and one inpoint handler thereby enclosing another clip, you can change the out- and inpoint of the two clips while the enclosed clip is fully maintained, in its length as well as in its contents. This way you can alter the position of the enclosed clip while the timeline length remains constant.



Enclosing a clip by selecting in-/outpoint handlers of neighboring clips

**Slip trimming:** When you select the in- and outpoint handlers of a single clip, you can change its in- and outpoint simultaneously. This will change the contents of the clip only. The length of the clip, its position and the length of the timeline is preserved.

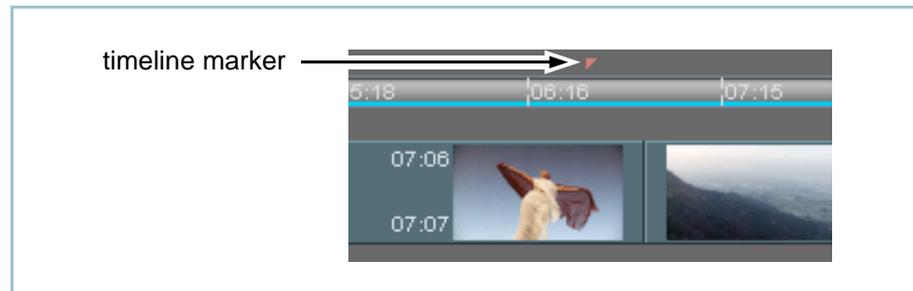


Changing the contents of a clip

## Understanding Markers

To mark certain positions in the timeline, e.g. to remind you to cut the clip at this position or for other reasons, you can place timeline markers in the timeline of the Edit Tool.

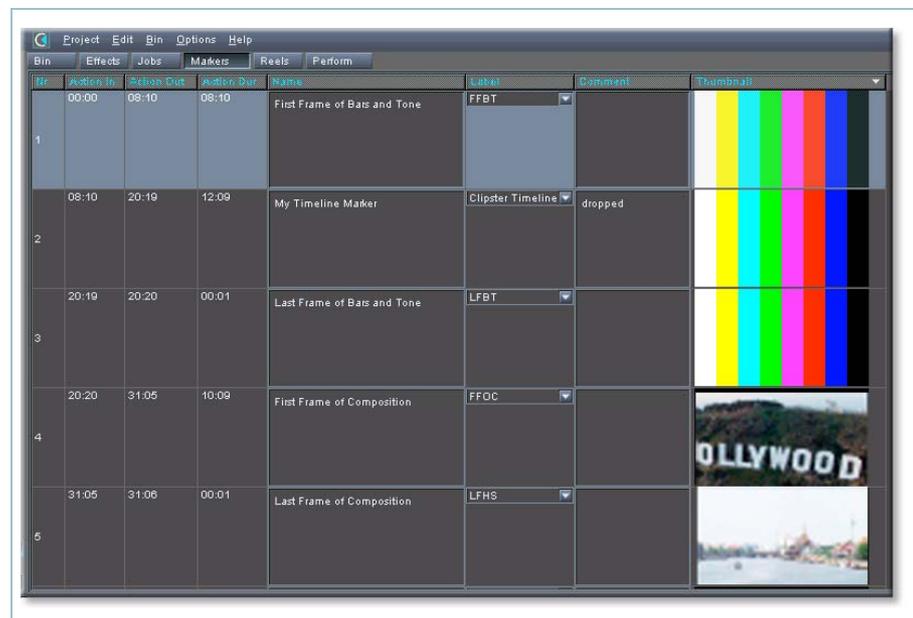
### Markers in the Timeline



Timeline marker in timeline

Once one or more markers are placed in the timeline you can easily jump to them with the respective controls (⏮ ⏭) of the control area. You can also use **Ctrl + arrow**, click on the respective marker in the timeline, or double click the marker row in the markers list.

The list of all markers positioned in the timeline is available via the **Markers** tab of the tool area.

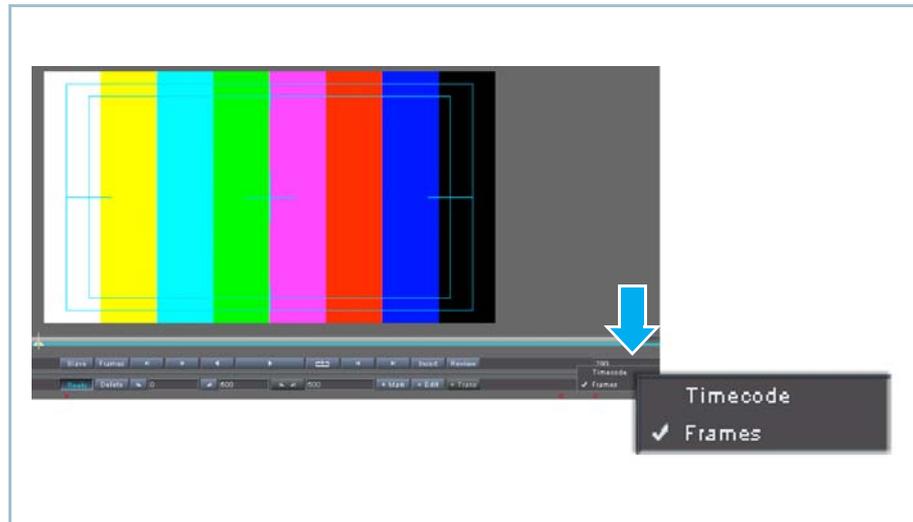




Column	Description																																				
Nr	Number of the marker in the timeline.																																				
Action In	Shows the actual position of the marker or, in terms of a timeline stretch indicated by the marker, its "Action Inpoint".																																				
Action Out	Shows the end of the timeline stretch indicated by the marker.																																				
Action Dur	Shows the duration of the timeline stretch indicated by the marker.																																				
Name	In the fields of this column you can enter a customized name for the marker. When exported to a CPL it is labeled as "Annotation text".																																				
Label	Selection of a particular marker. Markers related to specific deliverables are abbreviated, see also explanation tables further below. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <table border="1"> <thead> <tr> <th>Name</th> <th>Label</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>First Frame of Bars and Tone</td> <td>FFBT</td> <td></td> </tr> <tr> <td></td> <td>Clipster Timeline Marker</td> <td></td> </tr> <tr> <td></td> <td>FFBT</td> <td></td> </tr> <tr> <td></td> <td>FFCB</td> <td></td> </tr> <tr> <td></td> <td>FFCL</td> <td></td> </tr> <tr> <td></td> <td>FFCO</td> <td></td> </tr> <tr> <td></td> <td>FFDL</td> <td></td> </tr> <tr> <td></td> <td>FFEC</td> <td></td> </tr> <tr> <td></td> <td>FFHS</td> <td></td> </tr> <tr> <td></td> <td>FFMC</td> <td></td> </tr> <tr> <td></td> <td>FFOA</td> <td></td> </tr> </tbody> </table> </div>	Name	Label	Comment	First Frame of Bars and Tone	FFBT			Clipster Timeline Marker			FFBT			FFCB			FFCL			FFCO			FFDL			FFEC			FFHS			FFMC			FFOA	
Name	Label	Comment																																			
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	FFHS																																				
	FFMC																																				
	FFOA																																				
Comment	Same as the column <b>NAME</b> but only for internal use within a CLIPSTER project. Cannot be exported to a CPL.																																				
Thumbnail	This column shows a preview of the frame where the marker is positioned in the timeline as a thumbnail. The thumbnail view can be configured via the Configuration Tool.																																				



The offset indication for markers within the timeline can be displayed either in timecode or in frames, depending on the selected notation.



Selection of the notation for offset indication

The following types of markers are available for the timeline:

<b>IMF Marker</b>	IMF specific marker type. It is exported to the CPL of an Interoperable Master Package.
<b>DCI Marker</b>	DCI specific marker type. It is exported to the CPL of a Digital Cinema Package.
<b>CLIPSTER Timeline Marker</b>	A custom marker type for the timeline. It is not exported to the CPL of the output file.

 Offset indication for markers in CLIPSTER is always given absolutely to the timeline. Please note that in a CPL the indication of the same marker is given relatively to the current segment (e.g. the current reel).

**IMF Marker Type** IMF markers are content descriptors that specify certain elements on the timeline depending on their role within the video content such as **FIRST FRAME OF END CREDITS (FFEC)** or **FIRST FRAME OF COMMERCIAL BLACKS (FFCB)**. When creating an IMP they are exported into the CPL of the package, while all other marker types are ignored.

The IMF marker type includes the following markers:



## IMF Markers

<b>FFBT</b>	First Frame of Bars and Tone
<b>FFCB</b>	First Frame of Commercial Blacks
<b>FFCL</b>	First Frame of Company/Production Logo
<b>FFDL</b>	First Frame of Distribution Logo
<b>FFEC</b>	First Frame of End Credits. First displayable frame of content that contains any intensity of the End Credits (a non zero alpha value), which appear at the end of a feature.
<b>FFHS</b>	First Frame of Head Slate
<b>FFMC</b>	First displayable frame of content that contains any intensity of moving, rolling or scrolling credits (a non-zero alpha value), which appear at the end of the feature.
<b>FFOB</b>	First Frame of Ratings Band. First displayable frame of content of the Rating Band, which is usually a slate at the beginning of a feature.
<b>FFOC</b>	First Frame of Composition. The first frame of a composition that is intended for display.
<b>FFOA</b>	Audio First Frame. First frame of audio ring-in/ring-out where the video is in black.
<b>FFOI</b>	First Frame of Intermission
<b>FFSP</b>	First Frame of Digital Sync Pop
<b>FFTC</b>	First Frame of Title Credits. First displayable frame of content that contains any intensity of the Title Credits (a non zero alpha value), which appear at the beginning of a feature.
<b>FFTS</b>	First Frame of Tail Slate
<b>FPCI</b>	Fixed Point Candidate Insertion. Indicates possible point in the timeline where it would be allowable to insert content downstream. This is for material that may not have commercial blacks, but could indicate a candidate point where a commercial could be inserted.
<b>FPCO</b>	First Frame of Candidate Overlay. First frame of a sequence of frames where overlays, e.g. commercial overlays, may be placed.
<b>FTXC</b>	First Frame of Textless Title Credits
<b>FTXE</b>	First Frame of Textless End Credits
<b>FTXM</b>	First Frame of Textless Material Segment
<b>LFBT</b>	Last Frame of Bars and Tone



#### IMF Markers

<b>LFCB</b>	Last Frame of Commercial Blacks
<b>LFCL</b>	Last Frame of Company/Production Logo
<b>LFDL</b>	Last Frame of Distribution Logo
<b>LFEC</b>	Last Frame of End Credits. Last displayable frame of content that contains any intensity of the End Credits (a non zero alpha value), which appear at the end of a feature.
<b>LFHS</b>	Last Frame of Head Slate
<b>LFMC</b>	Last displayable frame of content that contains any intensity of moving, rolling or scrolling credits (a non-zero alpha value), which appear at the end of the feature.
<b>LFOB</b>	Last Frame of Ratings Band. Last displayable frame of content of the Rating Band, which is usually a slate at the beginning of a feature.
<b>LFOC</b>	Last Frame of Composition. The last frame of a composition that is intended for display.
<b>LFOI</b>	Last Frame of Intermission
<b>LFSP</b>	Last Frame of Digital Sync Pop
<b>LFTC</b>	Last Frame of Title Credits. Last displayable frame of content that contains any intensity of the Title Credits (a non zero alpha value), which appear at the beginning of a feature.
<b>LFTS</b>	Last Frame of Tail Slate
<b>LTXC</b>	Last frame of Textless Title Credits
<b>LTXE</b>	Last Frame of Textless End Credits
<b>LTXM</b>	Last frame of Textless Material Segment
<b>LFCO</b>	Last Frame of Candidate Overlay. Last frame of a sequence of frames where overlays, e.g. commercial overlays, may be placed.
<b>LFOA</b>	Audio Last Frame. Last frame of audio ring-in/ring-out where the video is in black.

**DCI Marker Type** DCI markers are content descriptors that specify certain elements on the timeline depending on their role within the digital cinema content such as **FIRST FRAME OF COMPOSITION (FFOC)**. When creating a DCP they are exported into the CPL of the package, while all other marker types are ignored.



All DCI markers are subset of the IMF marker type. Which markers on a timeline are exported in the end depends on the output type of the video.

The DCI marker type includes the following markers:

#### DCI markers

<b>FFOC</b>	First Frame of Composition. The first frame of a composition that is intended for display.
<b>LFOC</b>	Last Frame of Composition. The last frame of a composition that is intended for display.
<b>FFTC</b>	First Frame of Title Credits. First displayable frame of content that contains any intensity of the Title Credits (a non zero alpha value), which appear at the beginning of a feature.
<b>LFTC</b>	Last Frame of Title Credits. Last displayable frame of content that contains any intensity of the Title Credits (a non zero alpha value), which appear at the beginning of a feature.
<b>FFOI</b>	First Frame of Intermission
<b>LFOI</b>	Last Frame of Intermission
<b>FFEC</b>	First Frame of End Credits. First displayable frame of content that contains any intensity of the End Credits (a non zero alpha value), which appear at the end of a feature.
<b>LFEC</b>	Last Frame of End Credits. Last displayable frame of content that contains any intensity of the End Credits (a non zero alpha value), which appear at the end of a feature.
<b>FFOB</b>	First Frame of Ratings Band. First displayable frame of content of the Rating Band, which is usually a slate at the beginning of a feature.
<b>LFOB</b>	Last Frame of Ratings Band. Last displayable frame of content of the Rating Band, which is usually a slate at the beginning of a feature.
<b>FFMC</b>	First displayable frame of content that contains any intensity of moving, rolling or scrolling credits (a non-zero alpha value), which appear at the end of the feature.
<b>LFMC</b>	Last displayable frame of content that contains any intensity of moving, rolling or scrolling credits (a non-zero alpha value), which appear at the end of the feature.

#### CLIPSTER Timeline Markers

Use the CLIPSTER timeline marker type as you see fit. It is a custom type to help the user mark the timeline elements for custom purposes. This marker type cannot be exported.



Markers of the type CLIPSTER Timeline Marker can e.g. be used to show where drops occurred during a real-time operation. If this happens they can be easily placed via the performance monitor of the software. Afterwards they will be indicating the position of the drops that occurred.

## Marking Positions in the Timeline

This section explains how to set markers in the timeline.

### Setting Timeline Markers Manually

Markers of the type Timeline Marker can be manually placed in the timeline.

Perform the following steps:

1. Move the timeline cursor to the position where the marker should be set.
2. Select the button **+ MARK** available in the user interface of the CLIPSTER.



Alternatively, you can also use the menu option **Add Marker** on the context menu of the timeline scale.

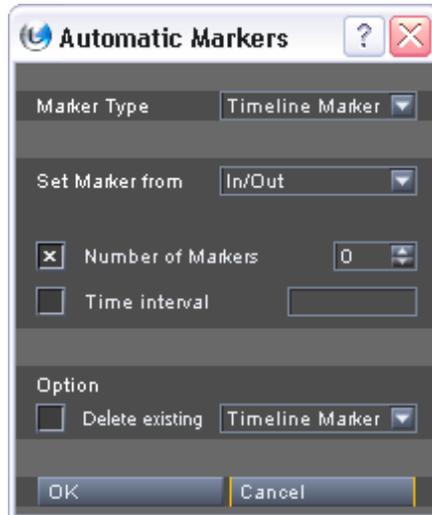
This will add a marker to the timeline of the Edit Tool at the current position of the timeline cursor.



### Setting Timeline Markers Automatically

Perform the following steps:

1. Select from the context menu of the timeline scale the menu option **Set markers automatically...**
  - ▶ The following window opens:



2. Configure the settings to automatically position markers according to your requirements.
3. Generate the markers by clicking the **OK** button

This will create the markers of the selected type in the timeline of the CLIPSTER.

### Removing Markers from the Timeline

Perform the following steps:

1. Jump with the timeline cursor to the respective timeline marker that you want to remove or place the timeline cursor manually on its position.
2. Then call up the context menu and select the menu option **Remove marker**.

This will remove the timeline marker from the timeline.

You also have the possibility at hand to remove all timeline markers in one step from the timeline. For this select the menu option **Remove all markers** from the context menu.

## Attaching Audio Clips to Video Clips

Sometimes during your editing work you may want to group audio and video clips, for instance, if they are already perfectly aligned and in synchronization. For this the timeline provides the possibility to attach an audio to a video clip.

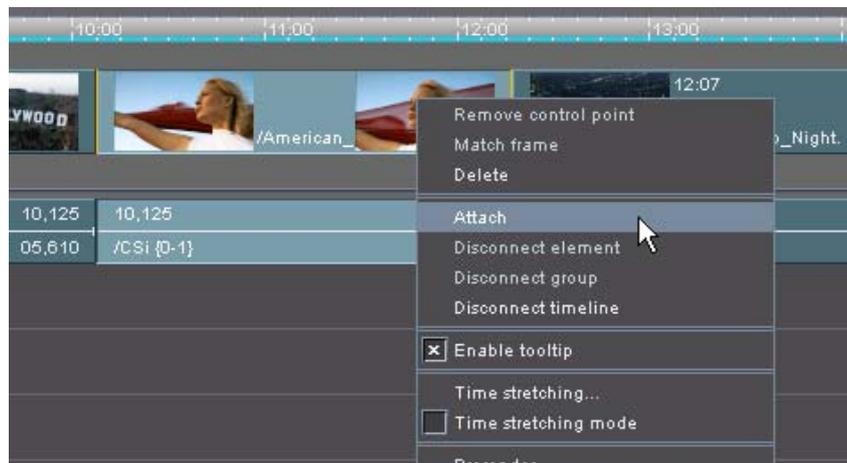


When attaching more than two timeline elements, you can attach one video clip to several audio clips only. It is not possible to attach several video clips to one or more audio clips. Furthermore, it is not possible to attach clips of one type only, e.g. audio clips only.

### Attaching Clips

Perform the following steps:

1. Select a video clip and one or more audio clips in the timeline area with the mouse while holding down the [Ctrl] key.
2. Release the [Ctrl] key and call up on one of the selected clips or on an empty part of the timeline the context menu.
3. On the context menu select the menu option **Attach**.



- ▶ Once this is done, the audio clip(s) will be attached to the selected video clip. Now, if either one of these clips is selected in the timeline, the other, attached clip(s) will be selected as well and they can then, for example, be moved easily together while their alignment and relative position to each other is maintained.



When working with attached clips in the timeline, you cannot switch to the insert mode anymore. The button to switch between the two different modes appears dimmed and is no longer available.

To activate the insert mode, all timeline elements have to be disconnected.

However, because attached clips can only be used in the overwrite mode of the Edit Tool, once clips are attached in the timeline, the software switches on the overwrite mode automatically.

### Disconnecting Attached Clips

To sever an attachment of clips or to switch back to the insert mode of the Edit Tool, you have to disconnect the attached clips.

Perform the following steps:

1. Select the attached clips or a specific clip of the attachment and call up its context menu.
2. Use one of the following menu options:

<b><i>Disconnect element</i></b>	Disconnects and severs only the selected clip from the attachment. If the attachment comprises several clips, i.e. one video clip and several audio clips, the rest of the attachment will be maintained.
<b><i>Disconnect group</i></b>	Disconnects and severs the attachment of all elements in the group where the context menu was invoked. Regardless of the number of timeline elements in the attachment all will be disconnected.
<b><i>Disconnect timeline</i></b>	Disconnects and severs the attachments of all attached timeline elements in the timeline in one step.

The attached clip(s) will be severed and disconnected. In case the timeline does not contain other attachments, the button for the insert mode will be available and ready for a selection again.

## Time Stretching or Time Compression of Video Clips

Video and audio clips added to the timeline can be time stretched or time compressed either in real time with common interpolations (frame/field repetition or skipping of frames/fields) or in non-real time with a high-end motion estimated algorithm. When specifying negative values for a video clip, the playout of a clip can be reversed.

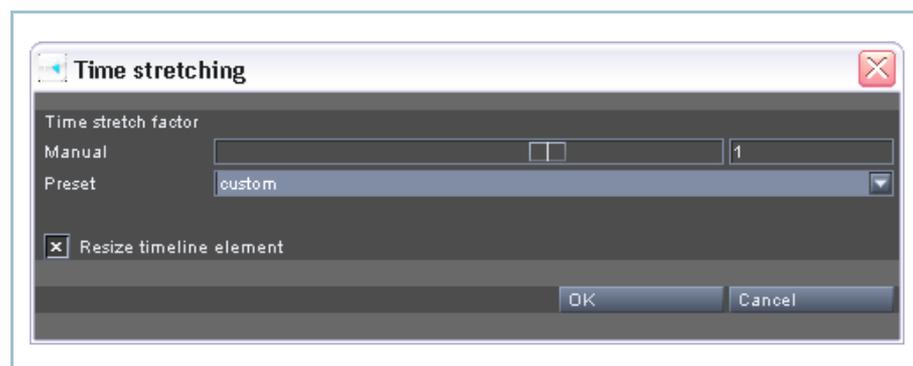
Time stretching or time compression allows you to speed up or slow down the playout of a clip, for instance, for slow/fast motion purposes or to match your project's pace. For this the respective timeline element can be automatically resized in the timeline, left in its original size (set via the clip's in- and outpoint) or adjusted to the desired length manually in the timeline.



When changing the timing of audio clips, no pitch control is provided. Thus it should be used for slight timing changes only.

For frequency changes of the timeline, e.g. when playing out or finalizing with a different video raster, an automatic retiming of audio can be configured (see "Audio Output Configuration" (page 130)).

You can configure the time stretching or time compression via the menu option **Time stretching...** on the context menu of a video clip. It will open the following window.



Time stretching or time compression configuration

To configure the time stretching or time compression, use the items offered under **Manual**. When adjusting the slider, the factor value in the entry field to the right changes accordingly. Alternatively, you can enter a factor directly in the entry field to the right of the slider.



Factor	Slider Movement	Meaning
> 1	right	Values greater than one (1) indicate a time compression of the video clip, i.e. its speed will be increased (fast motion).
0 - 1	left	Values from zero (0) to one (1) mean that the clip gets time stretched, i.e. its playout will be slower (slow motion).
< 0	left	<i>Video clips only:</i> Negative values will reverse the playout of the clip respectively.

The combo box **Preset** allows you to select common timing changes from its drop-down list. Once one of the predetermined settings is selected, the **Manual** items will be adjusted accordingly.

The **Resize Timeline Element** check box resizes the clip automatically in the timeline accordingly once the settings for stretching/compression are confirmed. When time stretched, the clip will be lengthened in the timeline (outpoint of the clip moves to the right); when time compressed, the clip will be shortened (outpoint moves to the left). If the check box is deactivated, the length of the timeline element in the timeline will be preserved, meaning when time stretched, the outpoint of the clip will be trimmed back; and when time compressed, the possible alteration depends on the available tail of this clip (without tail a time compression will not be possible).

The configured time stretching or time compression will be in effect for the clip in the timeline as soon as it is confirmed with the **OK** button. The button **CANCEL** closes the window without altering the settings.

Time stretching or time compression can also be performed directly in the timeline. This may be helpful when adjusting clips to a specific length in the timeline, for example, to fit inbetween two other clips. For this the **Time stretching mode** menu option on the context menu of a clip has to be activated (check mark in front of menu option). Then all alterations to the clip's in- or outpoint in the timeline (see "Setting an In- and Outpoint for the Timeline" (page 147)) will be a time stretching or time compression and the values in the time stretching or time compression

window will be altered automatically. With this the clip and its in- and outpoint can be easily aligned to other elements in the timeline via the snapping mode of the CLIPSTER to ensure it provides the correct length in the timeline (in- and outpoint remain constant while the speed is changed).



The playback of a video clip cannot be reversed when using the **Time stretching mode** in the timeline. For this it is recommended to change the sign (positive/negative) in the entry field of the window for the time stretching directly.

## Relinking Clips

Clips of either video or audio can be relinked in the timeline, i.e. they can be referenced to other source material manually from the timeline directly.

Perform the following steps:

1. Select the clip whose source material should be changed in the timeline.
2. Then select from the context menu of this clip the menu option **Relink...**
  - ▶ This will open the standard dialog window for the selection of a file.
3. Select the new source in this dialog window.



When linking to new material, the source in- and outpoint of the original clip in the timeline are used, i.e. its frame numbers. To receive images in the timeline, the new material must provide the same frame numbers for in- and outpoint as the original material.

Once confirmed with the button **OPEN**, the clip selected as the new source will be referenced to the clip's representation in the timeline and a new bin clip will be added to the root folder of the bin. Afterwards, in case of a video clip, you will see the new video material in the video overlay once the timeline cursor is positioned on this clip. Any heads and tails configured for the clip will be available with the new source material as well.



## Working with Video Clips

The Edit Tool works with representations of clips in the timeline only. This means that as long as you perform your work on the timeline, the original material on the storage is maintained and never altered.

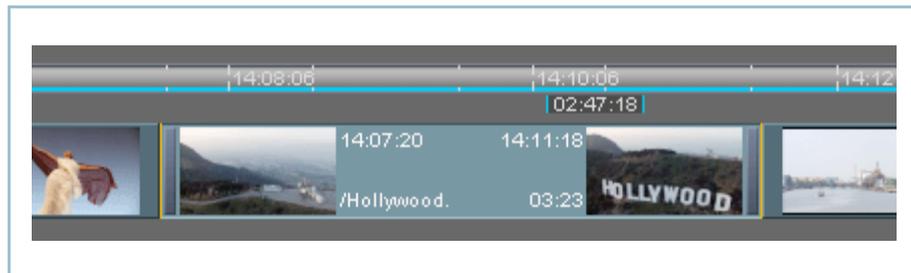
This section describes several features of video clips added to the video track(s) of the timeline of the Edit Tool.

The following topics are covered:

- Clip's Information (page 180)
- Context Menu of Video Clips (page 181)
- Consistencies of Clips (page 183)
- Matching an Individual Video Frame (page 184)
- Processing the Source Material of a Timeline Element (page 186)
- Vertical Editing of Video Clips in the Timeline (page 188)
- Scene Detection (page 189)
- Displaying the Alpha Channel (page 192)
- Color Matching (page 193)

### Clip's Information

The video clips in the video track(s) of the timeline provide several information via their text display.



Representation of video clip

top left

Usually, the exact inpoint of the clip on the timeline.



This value and its notation depend on the display setting for the timeline (timecode/frame notation) and the display type setting of the timeline.

top right	Usually, the exact outpoint of the last frame of the clip on the timeline.
	 This value and its notation depend on the display setting for the timeline (timecode/frame notation) and the display type setting of the timeline.
bottom left	Name of the clip as it is available in the bin together with its folder path.
bottom right	Length/duration of the clip.


 You can receive additional information about the clips via their tooltips which can be customized to your individual needs.

## Context Menu of Video Clips

The context menu of video clips (usually invoked with a right-click of the mouse) provides the following menu options and functions that can be used with video clips.

<b>Match » Frame</b>	If you want to know the exact position of an individual frame in the source material of the video clip or transfer this image (or the complete image sequence) to another application for further processing, you can select the menu option <b>Match » Frame</b> .
<b>Delete</b>	This menu option deletes the respective clip where the context menu was invoked from the timeline. Alternatively, you can select the clip and press the [Del] key on your keyboard.
<b>Attach Disconnect » Element Disconnect » Group Disconnect » Timeline</b>	These menu options enable you to work with attached clips: Sometimes during your editing work you may want to group audio and video clips, for example, if they are already perfectly aligned and in synchronization. For this the timeline provides the possibility to attach audio to video clips.



<b>Enable tooltip</b>	Clips added to the timeline provide various information via tooltips. With this menu option you can activate or deactivate the display of the tooltips when the mouse cursor is placed over a clip in the timeline area. If it is activated, the menu option will show a cross in front.
<b>Time stretching... Time stretching mode</b>	Video and audio clips added to the timeline can be time stretched or time compressed to speed up or slow down the playout of a clip, for example, for slow or fast motion purposes. When specifying negative values for a video clip, its playout can be reversed.
<b>Prerender</b>	If a timeline element needs to be prerendered, you can start the prerendering process with this menu option.
<b>Delete prerendering</b>	When a timeline element is already prerendered you can delete its prerendered files with this menu option.
<b>Add scene marker Delete scene marker Split at scene markers</b>	These menu options allow you to add and edit scene markers after an automatic .
<b>Conforming</b>	This menu option will be available for clips of an EDL after the EDL has been created in the timeline.
<b>Export to application</b>	When a clip is present in a video track of the timeline area, you can process its source material with a third party application of your choice either by using the original data directly (destructive export) or by previously copying the material beforehand. Afterwards it will be provided again in the software for further usage.
<b>Select all</b>	With this menu option all clips in the timeline area can be selected in one step.
<b>Cut Copy Paste</b>	Using these menu options timeline elements can be cut or copied to the clipboard of the operating system and afterwards pasted again at the location of your choice.

<b>Relink</b>	Once a clip is available in the timeline, it can be relinked, i.e. referenced to other source material manually from the timeline directly.
<b>Bin-Clip properties</b>	With this menu option you can open from a clip in the timeline the properties of its source clip in the bin.
<b>Show alpha channel only</b>	This menu option displays the alpha channel (key) of a video clip in the video overlay as well as at the outputs of the DVS system.
<b>Show » Effect properties</b>	With this menu option you can call up the properties of the timeline element where the context menu was invoked. They will be shown instead of the visible audio tracks right below the timeline area. Via the properties you can, for example, adjust zooming and panning or set color/gamma corrections for the respective clip.
<b>Add track</b>	Increases the amount of video tracks that will be visible in the timeline area by one.
<b>Remove track</b>	Decreases the amount of video tracks that will be visible in the timeline area by one.

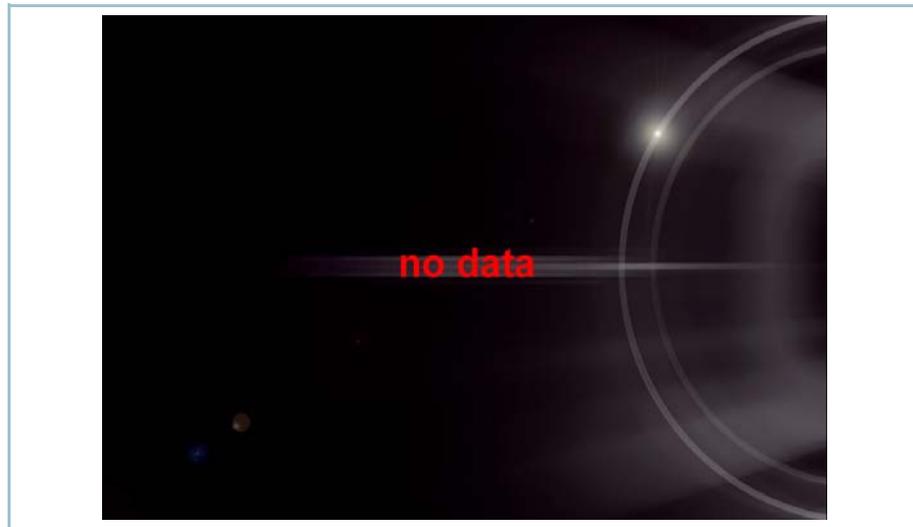
## Consistencies of Clips

During the loading of a project file or the import of a bin, video clips are checked for inconsistencies: It is tested whether the first and the last frame of each video clip is available on the storage. However, frames missing inbetween the first and the last frame are not verified automatically



If the first and/or last frame of a clip is missing, a message will be shown.

If a clip is played out where frames are missing, the missing frames will be substituted by the software automatically with a standard image.

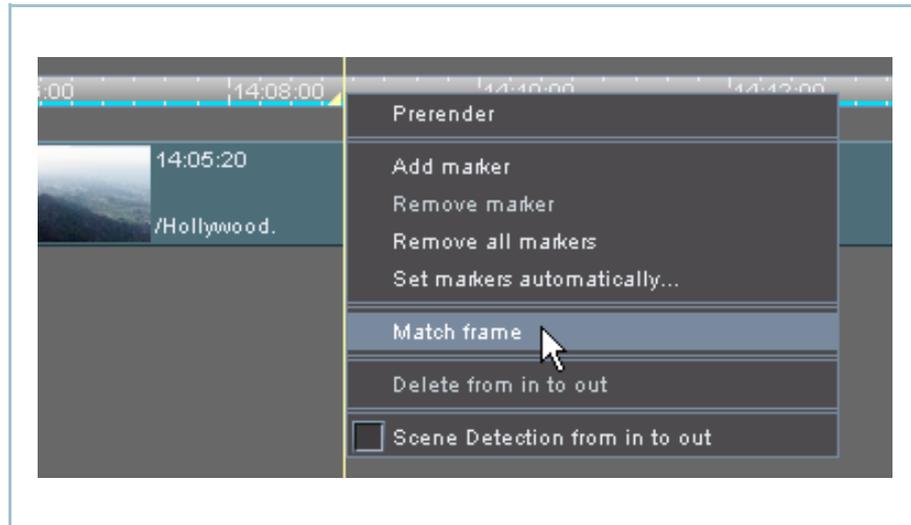


Substitute image for a missing frame

Then it is best to check your bin and thus your timeline for inconsistencies more thoroughly with the menu option **Check Bin** on the Bin menu.

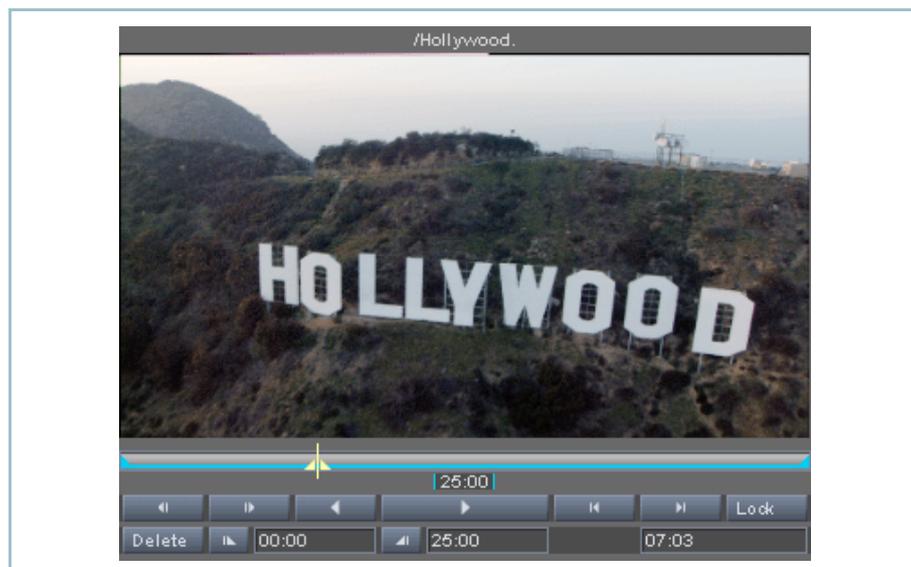
## Matching an Individual Video Frame

The matching of an individual video frame is especially useful in case you want to know the exact position of this frame in the source material of the clip or if you want to transfer this image (or the connected image sequence) to another application for further processing. Once the timeline cursor is placed on a specific image of a video clip in the timeline, you can select the menu option **Match > Frame** from the context menu of the timeline scale.



Matching an individual video frame

After this the control area of the Edit Tool switches to its source-edit mode and the particular frame together with its clip will be made available in the video overlay to the left of this mode.



The matched frame

Then you can easily recognize the exact frame position in its source material via the position field to the right because the scrub bar cursor will be placed accordingly. Additionally, the respective clip used in the timeline will be marked and visible in the bin to facilitate the identification of the source material

Afterwards you can transfer the selected image (or the complete image sequence) to another application for further processing (see "Processing the Source Material of a Video Clip" (page 105)).



To switch the control area back to its edit mode, use the appropriate button of the control area ().

## Processing the Source Material of a Timeline Element

The Edit Tool provides two ways to an export of either the original source material or a copied version of it to a third party application of your choice: You can export video data visible in the source-edit mode of the Edit Tool, or you can export video data that is available in the timeline to another application. This way you can process the source material of a video clip further and afterwards use it again in the software without any difficulty. This section describes how to process source material when a video clip was already added to the timeline of the Edit Tool.



The export of source material that is visible in the source-edit mode of the CLIPSTER is described in "Processing the Source Material of a Video Clip" (page 105).

When a clip is present in a video track of the timeline area, you can process its source material either by using the original data directly (destructive export) or by previously copying the material beforehand. To do this, you have to use the menu option **Export to application** on the context menu of a video clip in the timeline of the CLIPSTER. It opens a submenu where you can select other applications than the software to process your video data.

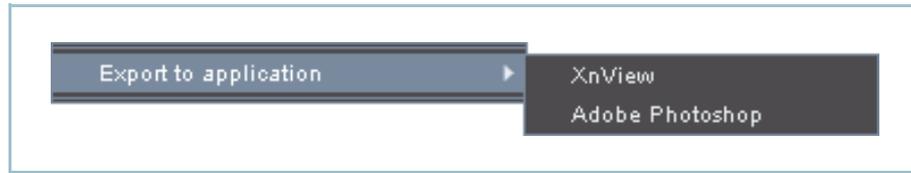


To have an application available in this submenu, you have to define and set it first. This can be done with the Configuration Tool (group **External**). Please note that you have to set the appropriate program parameters, if applicable, in the **Options** entry field as well.

### NOTICE

#### Data Loss

Please note that the Destructive export option is valid for all specified external applications. If activated, the source data will always be processed directly. When saving the data in such a case with an external application, the source material will be overwritten.



Accessing an external application

This menu option will export the source material of the clip according to your settings made for this application in the Configuration Tool.



When a sequence processing is enabled, each frame between a set in- and outpoint of the timeline will be sent to the external application. However, this applies to a single clip only: If the in- and outpoint are set outside of the clip where the menu option **Export to application** was called, only the image sequence of the clip where the menu option was called will be sent.

If a non-destructive export is selected for the external applications, the source material of the clip will be copied to the same path and location where the original material is stored with an incrementing number added to the directory name of the clip (*<name of clip's directory><incrementing number>*). After this the copied source material will be opened in the external application where you can process it. In the meantime the clip's representation in the timeline of the CLIPSTER will be changed to the location of the copied material, i.e. a new bin clip will be added to the bin of the CLIPSTER and the representation of the clip in the video track of the timeline will be changed to this new bin clip and location. As soon as you have processed the material with the other application and saved it, you can use it immediately in the software without having overwritten the original source (its bin clip is still present in the bin).

When a destructive export is selected for the external applications, no changes will be applied to the clip's representations in the CLIPSTER. The source material is sent directly to the external application where it can be processed. Once the changes are saved, the material can be immediately accessed with the DVS software. However, due to the destructive export, your original source material on the storage will be lost.



## Vertical Editing of Video Clips in the Timeline

With the Edit Tool and the timeline area configured to several video tracks you can perform a vertical editing in the timeline.



To perform a vertical editing, the timeline area has to be configured to contain more than one video track (see "Video Track Properties" (page 123)).

Tracks can also be added/removed via context menu.

The approach to work with several video tracks vertically in the timeline is different from the usual one of a horizontal editing in a timeline. Then the various tracks of the timeline form a stack: By placing different or differently edited timeline elements in other video tracks at the same position in the timeline you can change the contents for a playout at that position easily.

With vertical editing you still work with the video track(s) as usual, i.e. horizontally. But, for instance, in case you want to realize a temporary cutaway or to evaluate the visual outcome of different shots at a particular position in the timeline, simply place the respective timeline elements in another track in the timeline. The higher the track number the more priority is given to the respective track during a playout.

Then, with the help of enabling and disabling the respective tracks (button **M**, see "Muting and Locking Tracks" (page 151)) you can easily determine the best possible solution for your work.

Example 1:

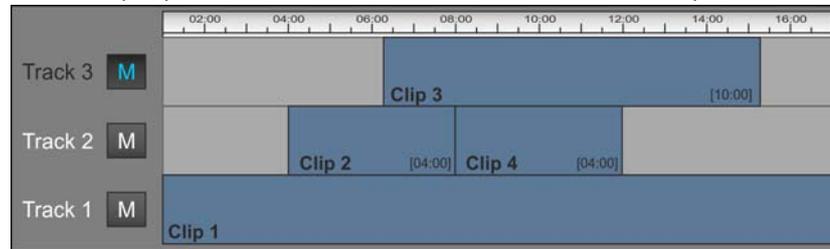
In the example below the timeline is configured to several video tracks. All tracks are enabled (not muted), i.e. all tracks will be played out. When a playout is initiated, the result will be that clip #3 overlays

the ones below it, i.e. the ones with a lower priority.

Play-out result:

Example 2:

In the second example the uppermost track is now disabled (muted). When a playout is initiated, this will lead to an output where



clip #3 is not given out at all while the clips #2 and #4 overlay the clip #1 present in the first video track (the one with the lowest priority).



The display of the video tracks can be reversed via the Configuration Tool. However, this does not affect the playout priority, i.e. the priority of the video track with the highest higher number over the others when enabled.

The software is able to autoconform offline composed projects into different video tracks (e.g. via its I/O Tool or the conforming tool). Thus, with the help of the vertical editing feature you can compare different versions of conformed projects easily in the timeline.

## Scene Detection

Video clips that were recorded from tape machines or telecines are often available in a single image sequence only. With the Edit Tool you can make a that automatically analyzes the video clip(s) for cuts. Afterwards the detected cuts/scenes are marked visibly in the timeline where they can be edited further and, if required, actually cut.

This section explains how to use the of the Edit Tool.

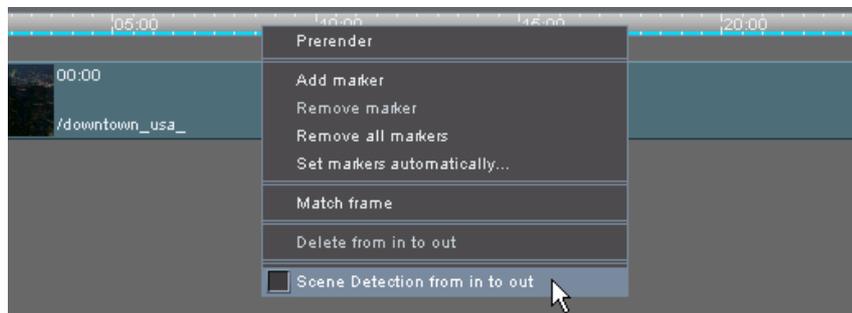
### Starting a Scene Detection



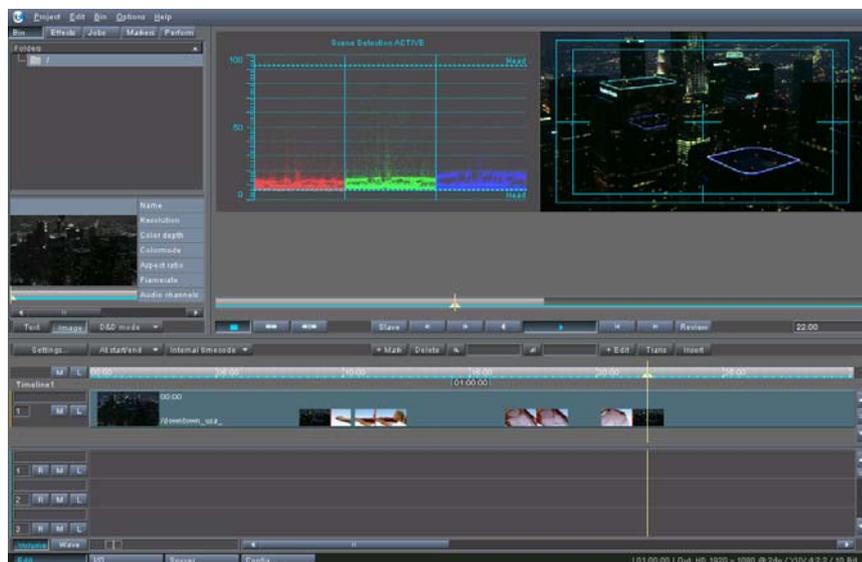
A Scene Detection can be performed in a single video track only, i.e. all others must be locked and muted (see "Muting and Locking Tracks" (page 151)).

Perform the following steps:

1. If not already available add the video clip that should be analyzed for scenes to the timeline.
2. If desired, use the in- and outpoint of the timeline to limit the Scene Detection to a part of the clip/timeline only.
3. Additionally, just for the analyze process you may change the output video format to a video raster with a higher frame rate (e.g. to 720p /60) to get a higher speed.
4. Select from the context menu of the timeline scale the menu option Scene Detection **from in to out**



▶ This will activate the Scene Detection: The CLIPSTER starts to play out the timeline (or the selected part of it) and in the control area the video scope Scene Detection is activated.



The video scope Scene Detection is an RGB parade that can be used to evaluate the Scene Detection. Furthermore, its graph will flash in white every time a scene is detected.

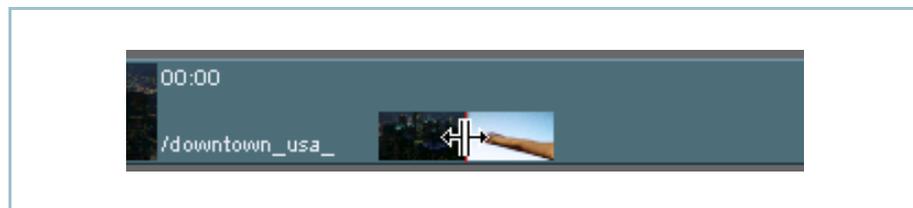
During the Scene Detection a luminance mean value is calculated over a number of frames of the played out clip. This is compared to a mean value of the single frame that is currently played out. If both values differ to some degree, a scene marker will be added at the respective position to the video clip.

The Scene Detection will be running until the playout stops at the end of the set timeline stretch or until it is terminated manually (e.g. with the controls).

### Editing the Scene Markers

The Scene Detection detects cuts reliably when the changes of scenery are distinct. However, if the content of the images varies much, cuts may be detected wrongly. For example, with its standard settings the Scene Detection will sometimes mark a camera panning as another scene because the image content between two frames differs considerably. Then you have the possibility at hand to edit the detected scenes.

After analyzing a clip you can jump to scene markers by selecting the clip in the timeline and using the respective controls (⏮ ⏭ or key [A]/[S] on your keyboard). Then by stepping single frames forward and backward you can determine whether the scene marker is properly placed. If not, it can be taken with the mouse and moved to another position freely:



Moving scene markers

Once the scene marker is positioned correctly, you can, for example, apply a hard cut to the clip.

Additionally, when calling the context menu on the video clip the following menu options are provided to edit the scene markers:

#### **Add scene marker**

Adds a scene marker manually. It will be added at the current position of the timeline cursor.

**Delete scene marker**

Deletes the scene marker currently selected by the timeline cursor. This menu option will be available as soon as the timeline cursor is positioned on a scene marker.

**Split at scene markers**

Cuts the clip at the position(s) of the scene marker(s). In case the was performed on several clips in the timeline, it has to be applied to each clip separately.

## Displaying the Alpha Channel

For blue-screen operations or compositing the alpha channel (key) of a video clip is important. With the software you can display the alpha channel of individual clips in the video overlay as well as at the outputs of the system.

To display the alpha channel of a video clip, you have to activate the menu option **Show alpha channel only** on the context menu of a video clip in the timeline of the CLIPSTER. Then the video overlay and the DVS system's video outputs will show you the alpha channel mask of the video clip where the menu option was activated. The parts of the images displayed in white are selected, black areas are not selected (i.e. keyed out).

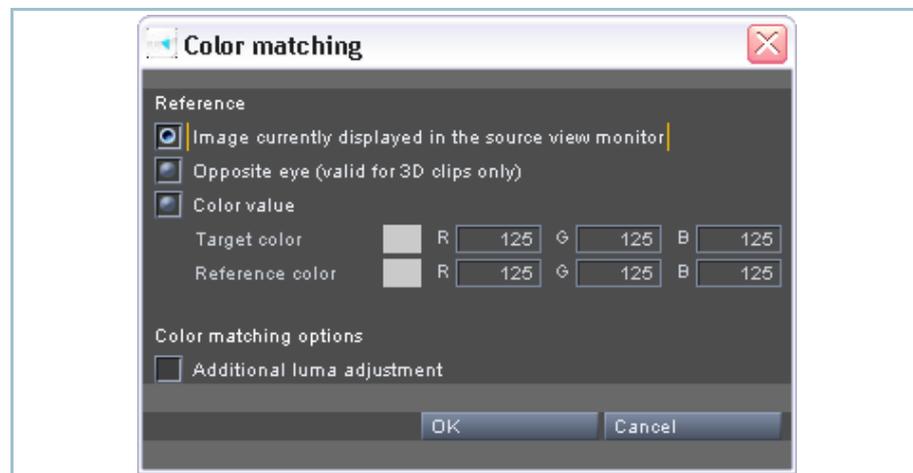


In case a clip provides no alpha channel, the displayed images will be completely white, showing that nothing is keyed out.

## Color Matching

With the automatic color matching feature you can automatically color correct differences of the colorimetry of two video clips. This is useful, for example, when a scene has been shot with multiple cameras at the same time or when different scenes should have been shot under identical light conditions.

Normally, the color matching uses as reference the image currently displayed in the source-edit mode (e.g. after matching an individual video frame; see "Matching an Individual Video Frame" (page 184)). Then, you can color correct a video clip by placing the timeline cursor on it and selecting the menu option Color matching on the context menu of the clip which will display the following window on the screen:



Window to configure an automatic color matching

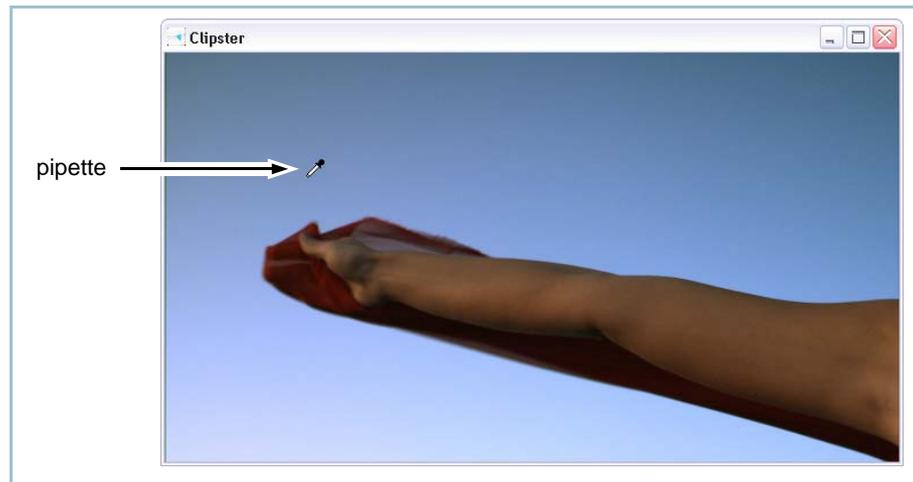
With the radio buttons in the area Reference you specify the mode of the color matching:

The first two radio buttons **Image currently** displayed in the source view monitor and **Opposite eye (valid for 3D clips only)** perform both an automatic color matching, using as reference for the first option the image shown in the source-edit mode and for the second the opposite eye of a 3D video clip



The option **Opposite eye (valid for 3D clips only)** is available for the 3D/stereoscopy workflow.

With the third radio button **Color value** you can manually perform a white balance correction based on specific colors: Either enter the color values for the reference and target colors manually in the respective **R**, **G** and **B** fields or click on the colored boxes in front of the entry fields. They will then show you in an extra window the reference/target image where you can pick the color via a pipette:



Picking color values of target or reference image

With the option **Additional luma adjustment** you can apply an additional statistical brightness adjustment.

Once your settings are made for the color matching, you can press the button **OK**. It will perform the color matching by applying a primary color correction operator to the selected clip.

## Working with Audio Clips

The R&S DVS software works with representations of the audio clips in the timeline only. Throughout your work in the CLIPSTER the original material on the storage is maintained and never altered.

By default the timeline area will show 16 audio tracks where you can add audio clips in the desired sequence, set fade-ins and -outs and control the volume of each clip.



The number of audio tracks displayed in the CLIPSTER can be set freely .

To get a proper output, you have to configure the audio hardware output accordingly (see "Audio Output Configuration" (page 130)).

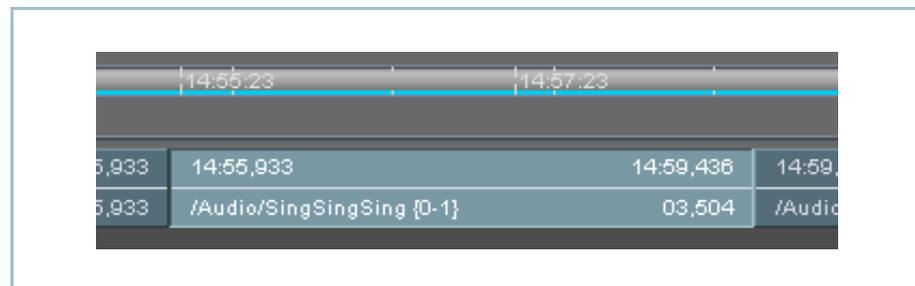
The software supports audio files with multiple mono or stereo channels. If you drag such a clip from the bin to the timeline, the additional channels will be added to the other audio tracks below the selected one.

The following topics are covered

- Clip's Information (page 195)
- Context Menu of Audio Clips (page 196)
- Volume Control (page 198)
- Waveform Display (page 200)

### Clip's Information

Audio clips in the audio tracks of the timeline provide several information via their text display.



Representation of audio clip



<b>top left</b>	Exact inpoint of clip on the timeline; with the timeline set to the timecode notation, the seconds and frames will be shown as seconds in a decimal number, i.e. with milliseconds; when the frame notation is activated, the inpoint will be displayed in milliseconds only
<b>top right</b>	Exact outpoint of the clip on the timeline (minus one sample); with the timeline set to the timecode notation, the seconds and frames will be shown as seconds in a decimal number, i.e. with milliseconds; when the frame notation is activated, the outpoint will be displayed in milliseconds only
<b>bottom left</b>	Name of the clip as it is available in the bin together with its folder path; in curly brackets the audio channels (streams) of the clip indicating its audio mode, e.g. 0-1 meaning a stereo stream of channel 0 and 1, or 0-0 meaning a mono stream of channel 0
<b>bottom right</b>	Length/duration of the clip



The audio mode of the clip can be changed in its clip properties (bin). For this the clip must not be present in the timeline of the CLIPSTER.

With the display type set to `File number`, the in- and outpoint information of the clips will provide the in- and outpoint with regard to the single audio file only (in milliseconds), i.e. untrimmed each audio clip in the timeline will begin with zero and end with its total duration (see also "Changing the Display Type" (page 127)).

## Context Menu of Audio Clips

The context menu of audio clips (usually invoked with a right-click of the mouse) provides the following menu options and functions that can be used with audio clips.



<b>Remove control point</b>	With this menu option you can delete a volume control point that was set on the volume control line.
<b>Delete</b>	This menu option deletes the respective clip where the context menu was invoked from the timeline. Alternatively, you can select the clip and press the [Del] key on your keyboard.
<b>Attach Disconnect » Element Disconnect » Group Disconnect » Timeline</b>	These menu options enable you to work with attached clips: Sometimes during your editing work you may want to group audio and video clips, for example, if they are already perfectly aligned and in synchronization. For this the timeline provides the possibility to attach audio to video clips, see "Attaching Audio Clips to Video Clips" (page 175).
<b>Enable tooltip</b>	Clips added to the timeline provide various information via tooltips. With this menu option you can activate or deactivate the display of the tooltips when the mouse cursor is placed over a clip in the timeline area. If it is activated, the menu option will show a cross in front.
<b>Time stretching... Time stretching mode</b>	Video and audio clips added to the timeline can be time stretched or time compressed to speed up or slow down the playout of a clip, for example, for slow or fast motion purposes, see section "Time Stretching or Time Compression of Video Clips" on page 177.
<b>Conforming</b>	This menu option will be available for clips of an EDL after the EDL has been created in the timeline.
<b>Select all</b>	With this menu option all clips in the timeline area can be selected in one step.
<b>Cut Copy Paste</b>	Using these menu options timeline elements can be cut or copied to the clipboard of the operating system and afterwards pasted again at the location of your choice.
<b>Relink</b>	Once a clip is available in the timeline, it can be relinked, i.e. referenced to other source material manually from the timeline directly. For further information see "Relinking Clips" (page 179).



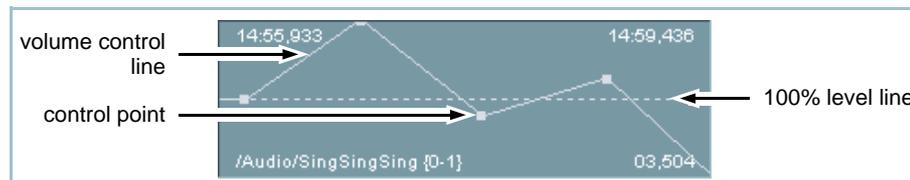
<b>Bin-Clip properties</b>	With this menu option you can open from a clip in the timeline the properties of its source clip in the bin.
<b>Add track</b>	Increases the amount of audio tracks that will be visible in the timeline area by one.
<b>Remove track</b>	Decreases the amount of audio tracks that will be visible in the timeline area by one.

## Volume Control

The button **Volume** is important for audio clips. You can find it at the bottom of the timeline area to the left of the sliders to change the timeline's view. This button displays or hides the volume control lines of audio clips.

### Understanding Volume Control

With the volume control lines you can change the volume for each clip separately. If the button **Volume** is in its active state, the volume control lines are visible.



Volume control of audio

After dragging an audio clip to one of the audio tracks from the bin, the whole volume control line is set to 100%. In this state there may be two volume control points available, one at the beginning of the clip and one at its end.



Whether the start and end control points are available depends on whether the clip is trimmed (in- and/or outpoint adjusted).

## Tuning the Audio Volume

To tune the audio volume up or down, you have to either use the already available volume control points or create new ones.

Perform the following steps:

1. Move the mouse cursor horizontally on the volume control line to the location where the control point should be added. As soon as you can add a control point, the mouse cursor changes to a cross.
2. Click with the mouse.
  - ▶ This will create a control point which can be moved in every direction on the audio clip.



The control points react to certain elements in the video and audio tracks of the timeline (snapping mode) to allow for an automated positioning. You can deactivate the snapping mode and activate a fine tuning mode by pressing the [Shift] key. Further information about the snapping mode can be found in "Controlling the Timeline" (page 144).

To delete a control point, select from its context menu the menu option **Remove control point**.

When you move the control point up or down, you can turn up or down the volume of the respective clip.

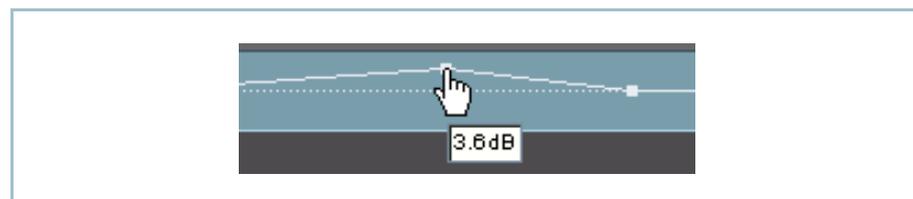
## Applying Audio Effects

If you want to create audio peaks or fade-in or -out audio, you have to create more than one control point and set them accordingly. There is no limit in the total number of control points.



Fades

To control the setting of a control point, the CLIPSTER shows you its current volume level in decibel via a tooltip. Simply move the mouse cursor over a control point to view its setting:



Decibel setting of control point



Decibel Indicator	Loudness (in %)
-12 dB	25%
-6 dB	50%
0.0 dB	100%
6 dB	200%
12 dB	400%

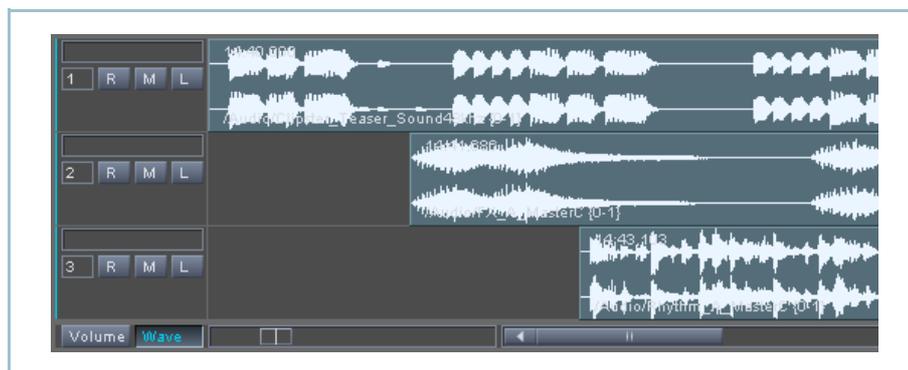


While a totally decreased control point means that audio is muted, a fully increased one does not necessarily mean that audio is set to 200%. You can move a control point beyond the limits of the audio clip which will increase the volume over 200%. This will be indicated by a shifted 100% level line: it is then located in the lower half of the audio clip.

## Waveform Display

With the button **Wave** you can switch on or off the waveform display of the audio clips in the timeline. You can find it at the bottom of the timeline area to the left of the sliders that change the timeline's view, directly to the right of the button **Volume**.

A waveform is a graphical representation of an audio signal and the **Wave** button displays or hides the wave forms of the audio clips:



Audio waveforms



For each channel available in the respective audio clip one waveform will be displayed, i.e. a mono clip provides one waveform only whereas a stereo clip shows two waveforms, one for each channel.



The appearance of the waveforms can be configured to your liking with the Configuration Tool.

## Working with Dolby® Atmos

This chapter describes the implementation of the Dolby Atmos feature when using a CLIPSTER system. The integration of the Dolby Atmos feature allows you to create digital content which adheres to the specifications of the Digital Cinema Initiative (DCI).

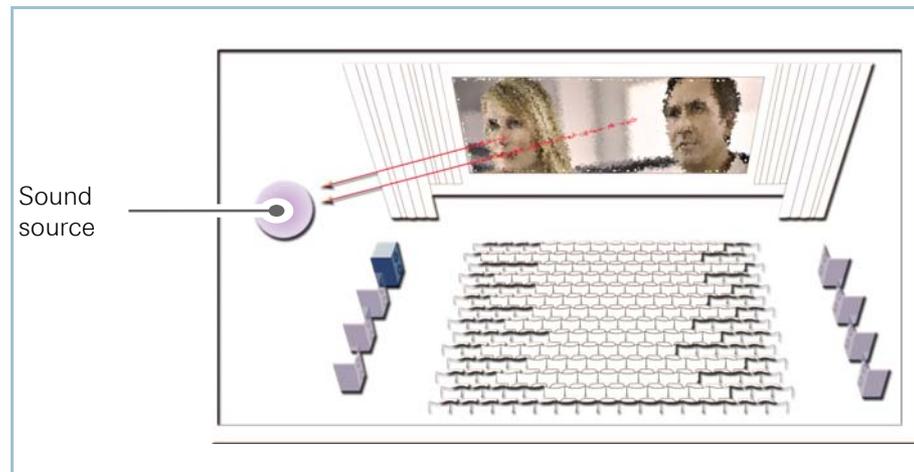
The following topics are covered:

- Understanding Dolby® Atmos (page 202)
- Dolby® Atmos within the CLIPSTER Context (page 203)
- Integrating Dolby® Atmos (page 207)

### Understanding Dolby® Atmos

Dolby Atmos offers a new cinema sound processing, featuring a flexible rendering engine that optimizes the audio quality.

Surround effects of the movie soundtrack are distributed to the loudspeaker layout while considering the characteristics of each room.

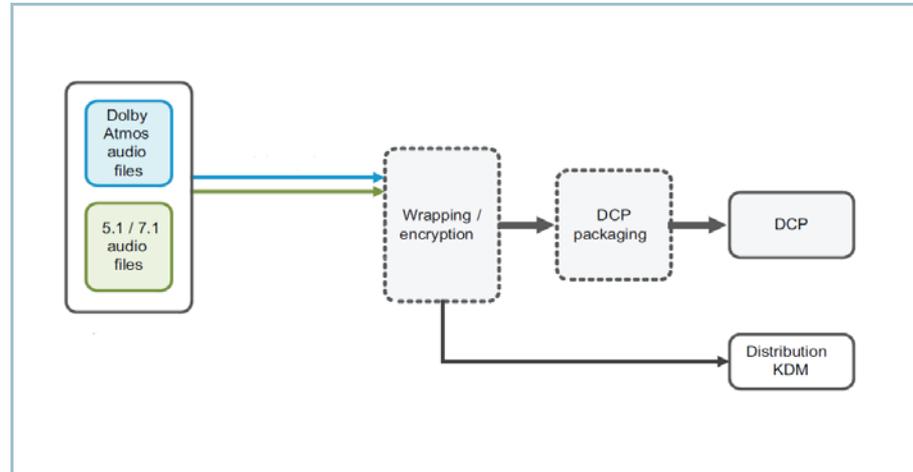


Dolby Atmos sound distribution in movie theaters

Dolby Atmos enhances the audio experience by the following features:

- Overhead sound
- Improved audio quality and timber matching
- Greater spatial control and resolution

The audio package consists of several audio tracks and metadata which have been mixed and brought together in a Dolby Atmos package. Those files are packaged using industry-standard MXF wrapping techniques to minimize the risk of changes, and delivered to the DCP creator.



Dolby Atmos integration workflow

## Dolby® Atmos within the CLIPSTER Context

In CLIPSTER, the user can select pre-mastered Dolby Atmos files and add them to the timeline like any other audio file. CLIPSTER supports several arrangements in the timeline:

- One Dolby Atmos file for every reel
- One Dolby Atmos file for several reels
- Several Dolby Atmos files for one reel
- No Dolby Atmos file in the reel

Dolby Atmos timeline elements are dark blue with a waveform representation. This is a downsampled mono track representation of the entire package, which is provided by Dolby for display purposes only. Currently this track is not audible when working with CLIPSTER.



**NOTICE**

**Invalid Audio Output**

It is not possible to play or edit the Dolby Atmos file in any way within CLIPSTER. Thus, the software cannot detect all possible invalid or incompatible combinations of properties.

**It is the user's responsibility to create a valid Dolby Atmos stream, should he add more than one Dolby Atmos element to a reel.**

There are some constraints regarding the use of Dolby Atmos in CLIPSTER. During the DCP creation, CLIPSTER automatically performs a consistency check and issues an error message if any of the constraints has been violated.

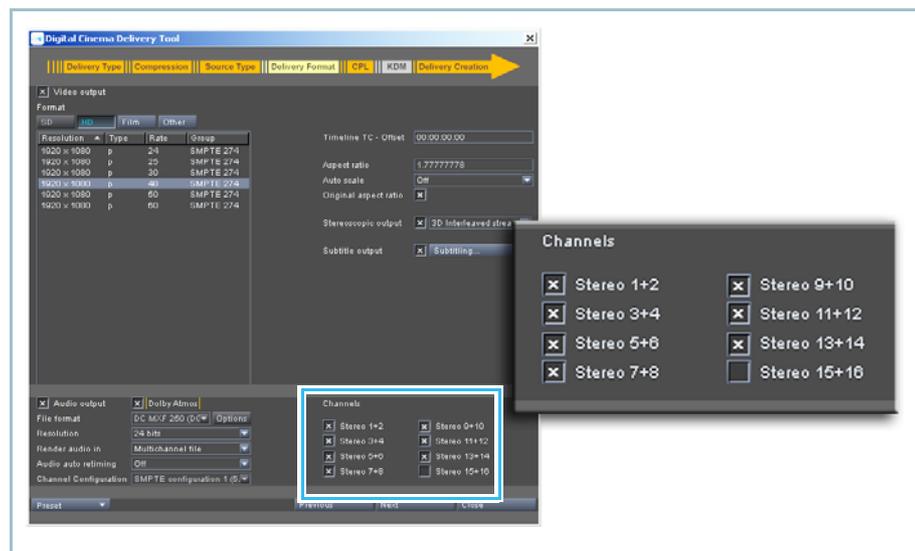
**Synchronization Constraints**

The synchronization signal is created at the time the main audio track file is created and embedded into channel 14. The main audio track file is always frame-wrapped at a frame rate that matches the video frame rate.



When creating a High Frame Rate DCP, make sure that the Dolby Atmos package is also flagged as HFR by the dubbing facility. Otherwise the creation in CLIPSTER will be aborted.

CLIPSTER automatically allocates the sync signal on audio channel 14 (starting with channel 1), as soon as the Dolby Atmos option is enabled, see "Generating the DCP with Dolby Atmos" (page 208).

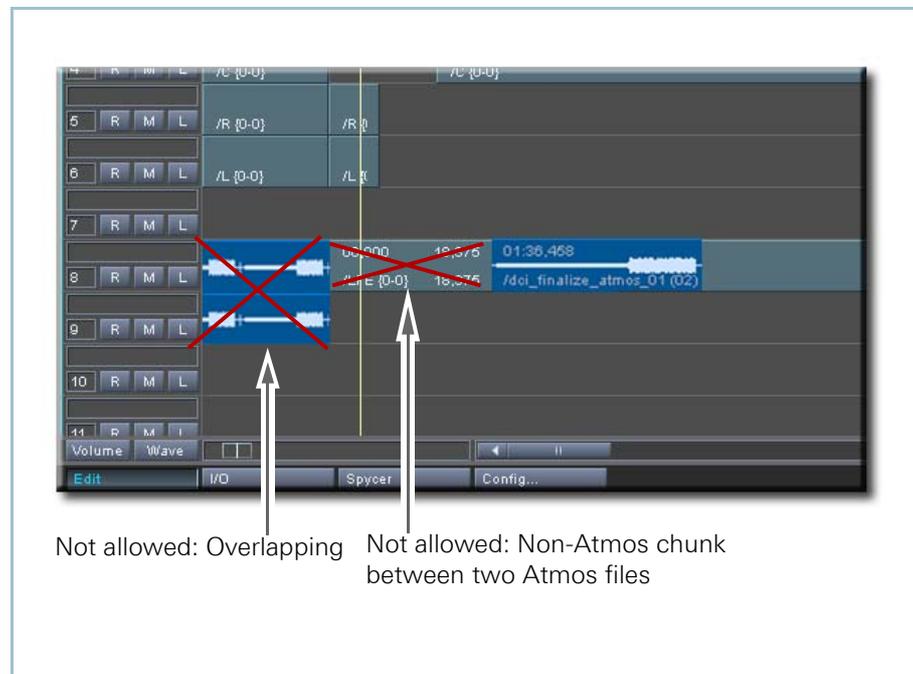


Allocation of audio channels with Dolby Atmos

Note that the synchronization signal is not linked to the video track or the Dolby Atmos track. This allows the same main audio track to be used with different Dolby Atmos tracks, though such an occurrence would be unusual. It also allows, for instance, a single main audio track to be referenced by several reels while each reel references a different Dolby Atmos track, or vice versa. As long as the sync signal is created at the time the main audio track is wrapped into MXF, it will be a valid signal.

### Editing Constraints

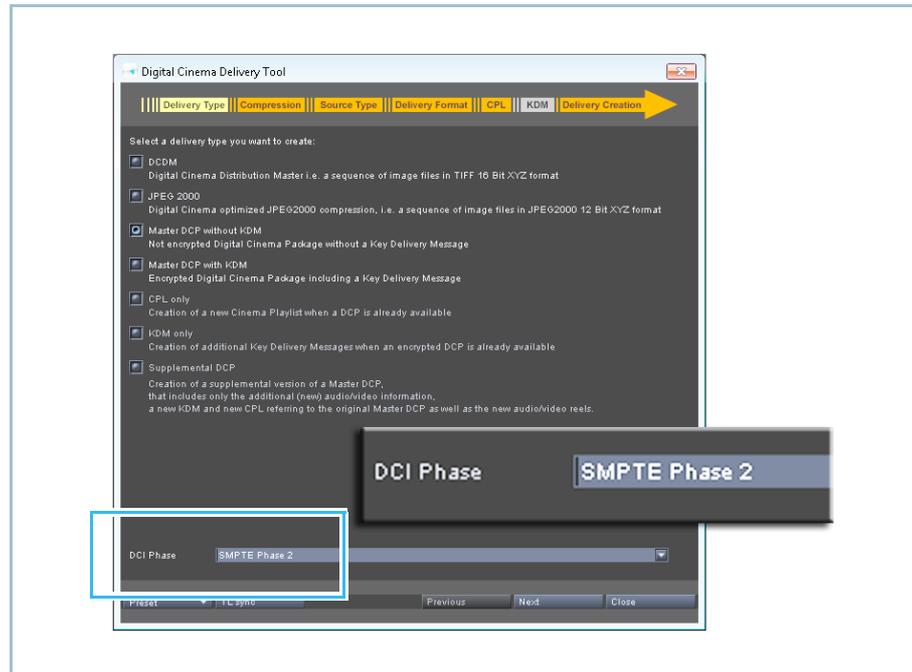
The Dolby Atmos file cannot be edited like a usual audio file. However, it may be sliced into various parts e.g. for the different reels (hard cut editing). In such cases, it is not allowed to overlap several Dolby Atmos files. It is also not possible to leave empty spaces between two Dolby Atmos files in the timeline:



Not allowed elements

### DCP Creation Constraints

All compositions carrying a Dolby Atmos track must comply with the SMPTE packaging format as defined by SMPTE 429-2. This format is to be set in the Digital Cinema Delivery Tool, see "Generating the DCP with Dolby Atmos" (page 208).



Digital Cinema Delivery Tool: selecting SMPTE standard

**Constraints summary**

The following table gives an overview of all the constraints when integrating Dolby Atmos files in CLIPSTER:

Constraint subject	Constraint
Packaging format	All compositions carrying a Dolby Atmos track must comply with the SMPTE packaging format as defined by SMPTE 429-2.
Reels	All reels that contain a Dolby Atmos track must also contain a main audio track.
	All reels within an Atmos composition must have the same number of tracks. If there are reels with no Dolby Atmos audio track, the main audio track must have the same number of channels as the main audio tracks in the reels that do have a Dolby Atmos track.

Constraint subject	Constraint
Main audio track	<p>All main audio tracks that are placed in an Atmos reel must contain an Atmos synchronization signal on channel 14.</p> <p>The synchronization signal shall comply with Dolby specification: „Digital Cinema Auxiliary Data Synchronization Signal“. The main audio track file shall carry a ChannelAssignment label indicating Configuration 4 (per SMPTE 429-2).</p>
KDM generation	<p>KDMs created for a composition with Dolby Atmos shall have the audio watermarking turned off on channel 14 in order to preserve the sync track. CLIPSTER automatically takes care for that.</p>

## Integrating Dolby® Atmos

The following topic guides you through the process of adding a Dolby Atmos file into the timeline and creating a DCP including the Dolby Atmos package.

### Adding a Dolby Atmos file

Perform the following steps:

1. Add the associated Dolby Atmos file to the Bin.
2. Drag and drop the Dolby Atmos file into the timeline to create the main audio track.
3. Process the content until completion. Consider "Editing Constraints" (page 205).

A Dolby Atmos file has been added.

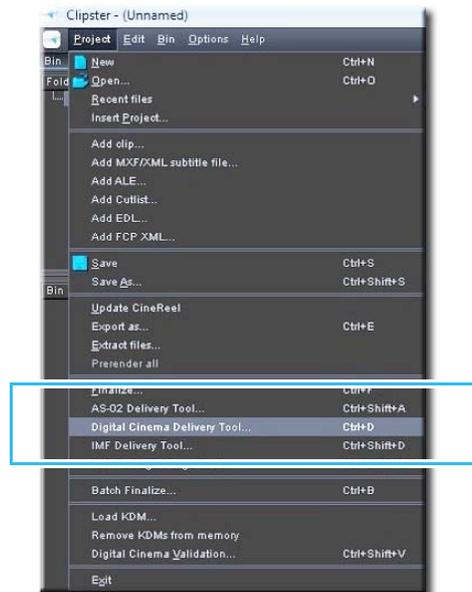


## Generating the DCP with Dolby Atmos

After the production is completed, it can be packaged into a DCP with Dolby Atmos integration.

Perform the following steps:

1. Start the DCP generation by clicking on **Project > Digital Cinema Delivery Tool...** on the menu bar or use the keyboard shortcut **[Ctrl.+D]**.

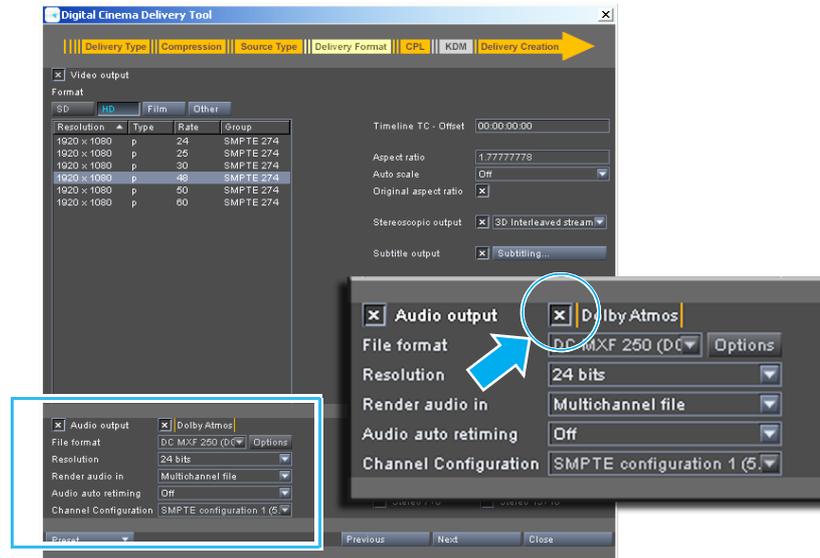


▶ The Digital Cinema Delivery Tool opens.

2. In section **Delivery Type** select **SMPTE Phase 2** as preferred DCI phase.



- Proceed with the Wizard until section Delivery Format. Activate the Dolby Atmos check box:



- ▶ Audio channels 1 - 14 are automatically allocated.

- Proceed with the Wizard until completion.

The DCP is now generated with Dolby Atmos integration.



## Timeline Element Properties

Timeline element properties are provided for video clips as well as transitions. They can be used to determine the appearance of the respective element in the timeline further. While with the properties of a transition you can, for example, set the type of wipe used for the transition, with the ones for a video clip you can add effects operators to the clip or perform a color correction by setting a static 1D LUT.

The effects operators of video clips provide you with additional editing features for your video processing tasks. However, they may be part of optional packages.

The following topics are covered:

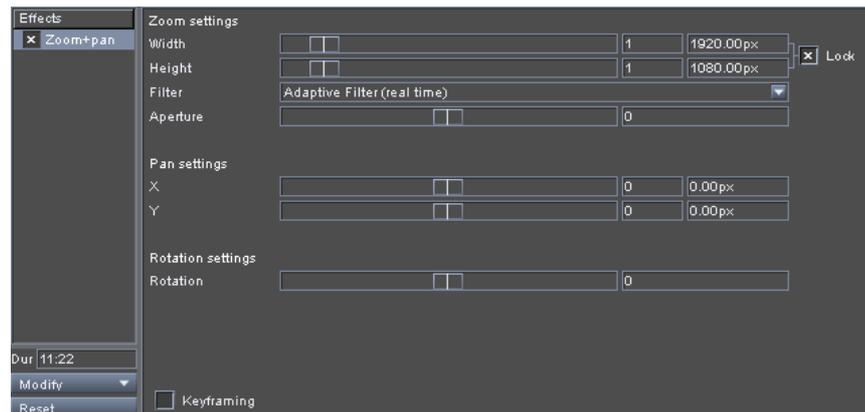
- Accessing the Timeline Element Properties (page 211)
- General Items of the Properties Area (page 211)
- Properties of a Transition (page 212)
- Properties of a Video Clip (page 216)
- The Operator 'Zoom+pan' (page 221)
- The Operator 'Flip+flop' (page 225)
- The Operator 'Deinterlace' (page 226)
- Color Correction Operators (page 228)
- Keyframing (page 229)

## Accessing the Timeline Element Properties

The properties of timeline elements can be accessed easily in CLIPSTER. They will be shown instead of the visible audio tracks right below the timeline area in an area of their own.

Perform the following steps:

1. Call up the context menu of a timeline element present in the video track of the timeline area.
2. Select the menu option **Show » Effect properties** or double-click the timeline element in the timeline to call up the properties.
  - ▶ The properties area will be displayed right below the timeline area instead of the audio tracks. It will show you immediately the properties of the selected element where the context menu was invoked:



To view changes to an effect with the overlay of the control area immediately, make sure that the timeline cursor is positioned on the clip where the effect was added.

With the timeline element properties area visible in the user interface, you can display the properties of every timeline element as soon as it is selected in the video track.

## General Items of the Properties Area

This section explains the items that are available in the properties area for all timeline elements.

Once the timeline element properties are visible beneath the timeline, you can find to the left side the following elements:



General items of the properties area

With the **Dur** field you can change the length of the selected timeline element frame accurately. Simply type in the desired length (duration) of the timeline element and confirm your entry with the [Enter] key. After this the outpoint of the selected element in the timeline will take on the adjusted length.

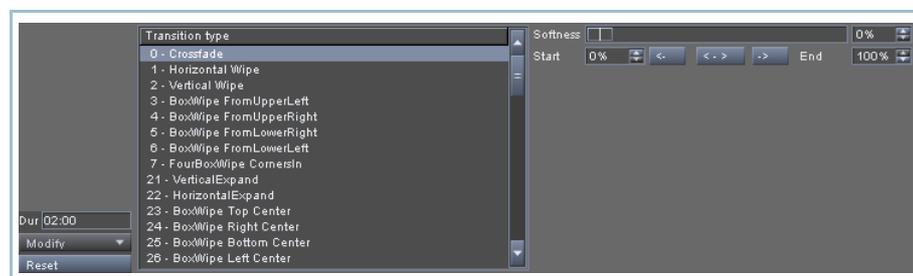
The drop-down menu of the **Modify** item allows you to copy the settings of the currently selected timeline element or, with video clips, of the currently selected and displayed effects operator to the same type of timeline element (in this track of the timeline). They can be selectively copied, for example, only to the elements that precede the selected one (**All clips before**) or to the elements that succeed it (**All clips after**). Additionally, they can be copied to the **Opposite eye** (in case of a 3D clip) or to certain kinds of clips depending on their metadata or their origin from a data list (e.g. ALE, EDL or cut list).

With the **Reset** button you can restore the default settings of the currently selected timeline element or, with video clips, of the currently selected and displayed effects operator.

## Properties of a Transition

As soon as a transition is selected in the timeline, its properties are displayed in the timeline element properties area right below the timeline area.

By default a transition is set to the wipe **Crossfade**. This can be changed via the properties of a transition easily:

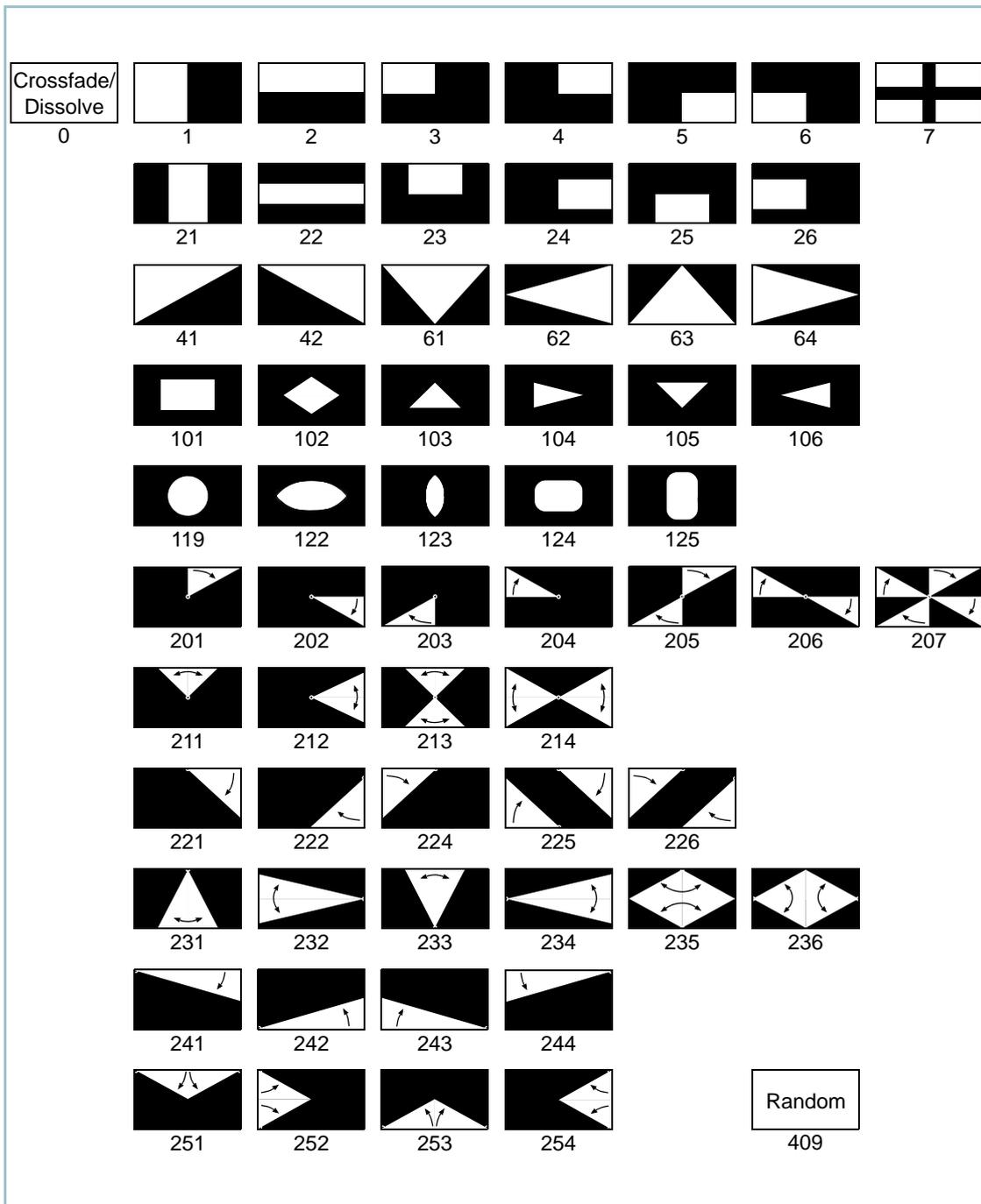


Transition properties

In the properties of the transition you can select another wipe for the transition than the default one from the **Transition type** list box. The following lists the transitions that are currently implemented. The numbers indicate the SMPTE number which are provided in the **Transition type** list box as well:



The graphics show the effects of the respective wipe and, if not reversed, the transition occurs towards the (increasing) white area.



SMPTE wipes of the R&S DVS software

After selecting one of the available wipes you have further possibilities at hand to adjust the transition:



Item	Description
<b>Softness</b>	Use the <b>Softness</b> slider and the percentage value to its right to adjust the softness (feathering) of the wipe. Then the edges of the emerging image appear softer so that they blend into the receding image with less contrast. With the slider you can set the softness to values between 0 and 100%. However, with the percentage value to the right of the slider you can select values even greater than 100%: Use the controls to the right of the entry field to step the value up or down until it is set as desired.
<b>Start</b>	The <b>Start</b> entry field indicates in percent the starting point of the transition. If adjusted, the operator will begin the transition at a later point of its phases to blend into the receding image. If this value is greater than the value set in the <b>End</b> entry field, the transition effect will be reversed, i.e. a change will appear towards the (increasing) black area.
	This button transfers the value set in the <b>End</b> entry field to the <b>Start</b> entry field (from right to left).
	This button exchanges the values between the <b>End</b> and <b>Start</b> entry fields. The value of the <b>End</b> entry field will be transferred to the <b>Start</b> entry field and vice versa.
	With this button you can transfer the value set in the <b>Start</b> entry field to the <b>End</b> entry field (from left to right).
<b>End</b>	The <b>End</b> entry field indicates in percent the ending point of the transition. If adjusted, the operator will conclude the transition at an earlier point of its phases to blend into the receding image. If this value is less than the value set in the <b>Start</b> entry field, the transition effect will be reversed, i.e. a change will appear towards the (increasing) black area.



As soon as an item of the transition properties is altered its effect is immediately applied to the selected transition between two clips. Once the transition properties are set, you can, for example, review the transition and evaluate its effect easily with the **Review** button of the controls.

## Properties of a Video Clip

Every video clip added to the timeline provides timeline element properties which offer you additional editing features for your work. These editing features can be accessed in the form of effects operators.

Usually, effects operators are applied to single clips on the timeline only but their settings can be transferred to other clips of the timeline easily.

### Available Effects Operators

Depending on its optional features, the software provides for the CLIPSTER various operators that enhance the editing functionality of the system. The following effects operators are available:

Effects Operator	Availability	Description
1st color correction	default	Operator for a primary color/gamma correction. Additionally, you can assign a static look-up table (LUT) to clips and thus perform a color and/or gamma correction with a single file.
2nd color correction	default	Vector-based secondary color correction allowing you to color correct your clip with several definable color vectors.
6 vector color correction	default	Color correction operator providing six predefined colors for a selective color correction.
3D auto correction	default	Part of the 3D/stereoscopic workflow feature, see chapter "3D Stereoscopy" on page 429.

Effects Operator	Availability	Description
Picture masks	default	Picture masks allow the usage of an effect on a selectable part of a clip only. The part of the images that will be affected can be set with freely definable shapes (masks).
Flip+flop	default	Operator that enables you to mirror the video image vertically and/or horizontally.
Zoom+pan	default	Allows to set, for example, zooming and/or panning for the video clip in the timeline. It is by default available for all clips in the timeline.
Raw decode operators	optional	Special operators that color correct the raw data of the material coming from certain cameras, see "Working with JPEG2000 and Raw Content" (page 25).
Deinterlace	default	Applies either line based algorithms or motion estimation for a deinterlacing of interlaced material. With it you can render a clip from an interlaced image format to a progressive one.
DCI XML subtitling	optional	Part of the DCI Mastering feature. See chapter "DCI Mastering" on page 359.

In addition to these, the CLIPSTER supports the OpenFX plug-in interface enabling you to extend its effects feature set with plug-ins developed by third parties. Once installed, they can be accessed in the effects pane the same way as the effects operators provided by R&S DVS.

## Adding Effects

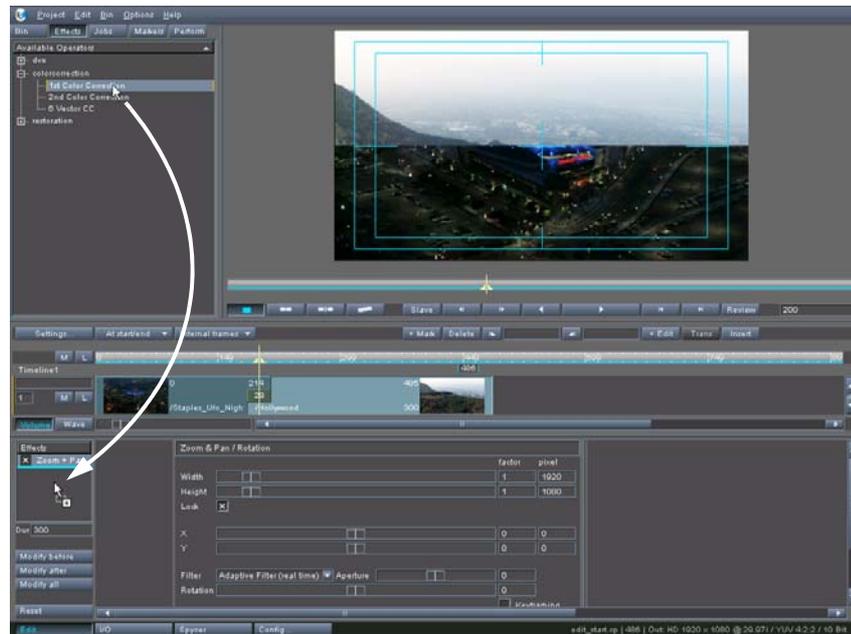
As soon as a video clip is selected in the timeline, its properties are displayed in the timeline element properties area right below the timeline area. Then the clip is ready to receive an effects operator.



If the properties area is not visible in the Edit Tool, you have to display it first, see section “Accessing the Timeline Element Properties” on page 211.

Perform the following steps:

1. Activate the tab **Effects** in the tool area of the Edit Tool.
2. Select from one of the folders the respective effects operator that you want to apply and drag and drop it to the **Effects** list of the timeline element properties.



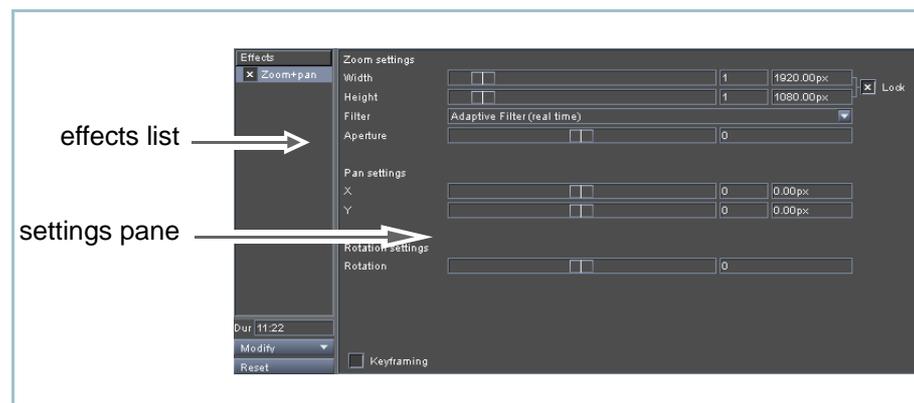
Some effects operators or combination of operators are not realtime capable. Prior to a playout their application has to be rendered.

To delete an applied effect from the effects list of the clip in the timeline, you can select the respective effect and press the [Del] key.

This will apply the selected effect to the clip whose properties are displayed in the area of the timeline element properties. Its settings controls will be made available in the settings pane to the right where you can then perform the desired adjustments.

### Altering Effect Settings

With the timeline element properties area you can set the properties of a video clip via the available effects operators. The effects added to a video clip in the timeline can be accessed easily with the effects list to the left.



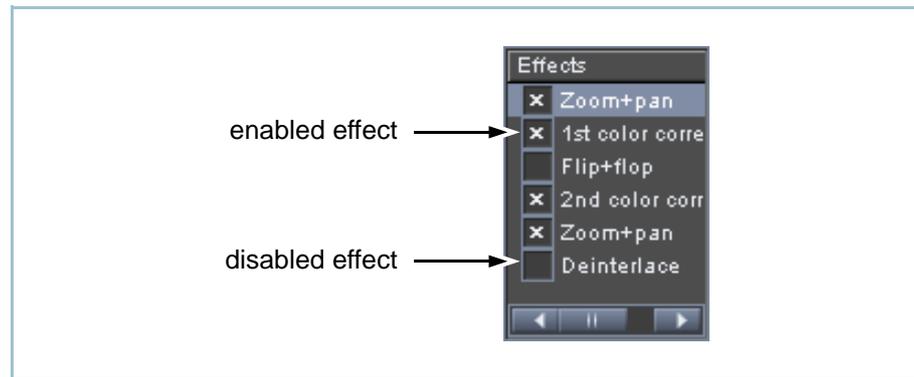
Video clip properties

Select an effect from the effects list and its settings are immediately displayed in the settings pane to the right of the list. Then they can be altered according to your liking and the changes are directly applied to the clip in the timeline.



To view changes to the effects immediately with the overlay of the control area, make sure that the timeline cursor is positioned on the clip currently selected in the timeline.

With the check boxes in front of the effects operators available in the effects list you can enable or disable effects. If a check box in front of an effect is activated, it is enabled; if it is deactivated, it is disabled. Thus you can easily evaluate the outcome of an individual effect by comparing it with the original image or other applied effects.



Enabling or disabling effects of a video clip

If you need an operator to be applied to a limited range of frames of a clip only, you have to edit the clip with hard cuts beforehand because the applied effects are valid always for a whole timeline clip.



Some effects operators or combination of operators are not realtime capable. Prior to a playout their application has to be rendered.

The sequence of all added effects to a clip that are listed in the effects list is important as well. They are applied top to bottom, i.e. the effect at the top of the list will be applied first to the clip followed successively by the rest of the added effects. This may be especially important when applying the same effect type several times, because, for instance, in case of a color correction, the bottom color correction will be applied to the colors corrected by the top color correction(s). You can change the sequence of the effects in the effects list easily via drag-and-drop. Simply select one effect and drag it to the desired position within the list.

An effect can be deleted from the effects list of a clip the same way you delete a clip from the timeline. Just select the effect from the effects list in the timeline element properties and press the key [Del] on your keyboard or select from its context menu the menu option **Delete**.



To apply the same effect settings to other clips in the timeline, you can either use the general items to the left of the timeline element properties area or use preset effects.



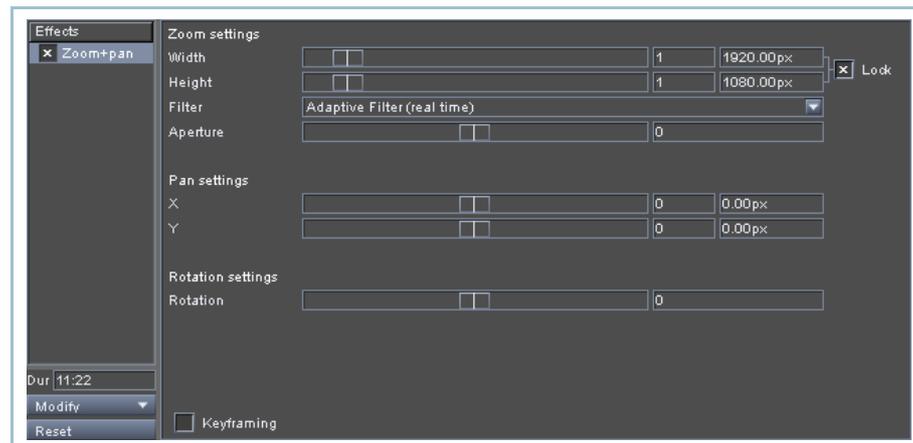
When transferring settings to other clips in the timeline (e.g. via the **Modify** item), only the settings of the currently selected operator are copied. In case you want to apply the settings of another operator to clips in the timeline, you have to select it in the effects list and perform the same procedure again.

## The Operator 'Zoom+pan'

The operator 'Zoom+pan' allows to zoom, pan and rotate as well as to sharpen or blur the contents of the video clip in the timeline. It is by default available and active for all clips in the timeline and thus the first operator visible in the timeline element properties area after it has been accessed.

### Zoom Settings

With the **Zoom settings** you can adjust the zooming and configure it further.



Zoom and pan operator

You can use the sliders for width and height to set the zooming: Pull the sliders to the left to zoom out of the clip or to the right to zoom in.

Additionally, you can enter either the zoom factor or the pixel size that the original frames should be set to in the respective entry fields to the right of the sliders manually.



Slider	Slider Movement	Result	Factor Range
Width / Height	left	zoom out	< 1
	right	zoom in	> 1

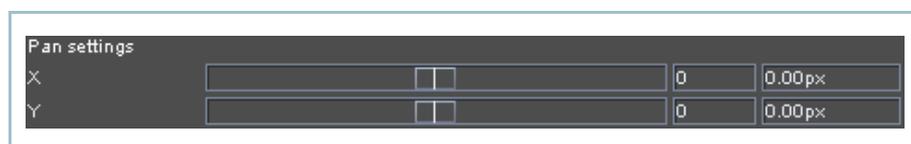
With the check box **Lock** activated, the original aspect ratio (the relation of width (x) and height (y) of the video format) can be preserved. If enabled, the images will not get stretched or compressed and the remaining other setting will adjust itself automatically.

The way a zooming of the video clip is performed can be influenced with the combo box **Filter**. It is also associated with the slider **Aperture** (sharpness) and determines the algorithm that will be used to change the video image content. The following settings are available.

Filter	Meaning
Software Filter (rendering)	With this setting the best possible filter is selected. It provides a software based sophisticated algorithm for all settings of the operator 'Zoom+pan'. However, if this filter is used, the clip has to be prerendered prior to a playout.
Adaptive Filter (real time)	Default setting for zooming. It provides an optimized filtering for every scaling factor which will result in high-end quality pictures. This filter is real-time capable.
Adaptive+ Filter (real time)	Doubles the precision and quality of the 'Adaptive Filter' by using hardware resources that are normally used to calculate transitions in real time. When this filter is selected for zoomed clips, transitions between these clips may require a prerendering. This can be avoided by either removing a scaling or setting the clips to the default 'Adaptive Filter'.
AdaptiveExtra Filter (real time)	Same as the 'Adaptive+ Filter' with the sharpness and details of the pictures further enhanced.

Filter	Meaning
Downconvert (real time)	Special filter available for a conversion of clips in larger resolutions to lower ones, reducing interlace flickering as well. Optimized for a conversion of HD material to SD.
Downconvert+ (real time)	Same as the 'Downconvert' filter with the sharpness and details of the pictures further enhanced.
Classic (real time)	Uses an algorithm without filtering and is ideal when working with light scaling factors only, because it results in very sharp pictures. If this filter is selected, all alterations will be performed in real time, but <b>Aperture</b> (sharpness) cannot be controlled manually.
Bilinear (real time)	Applies a bilinear filtering to the zoomed images and may be appropriate for greater scaling factors. It is real-time capable, but <b>Aperture</b> (sharpness) cannot be controlled manually.
Bicubic (real time)	Applies a bicubic filtering to the zoomed images.
Sharpness (real time)	Special filter to sharpen the images. It is ideal for ARRI ALEXA material and will be automatically applied to such clips when added to the timeline.

**Pan Settings** To achieve a panning for the currently selected clip, two sliders are at your disposal.



The settings for panning

With them you can move, for instance, in a zoomed clip to the part of the clip (image) that should be displayed during a playout. For example, if you move the X slider to the left, the image will move to the left; and if you move the Y slider to the left, it moves up:



Slider	Slider Movement	Image Movement	Factor and Pixel Range
X	left		negative
	right		positive
Y	left		negative
	right		positive

As already indicated in the table above to the right of the sliders you can find entry fields where you can specify either the image movement factor or the movement in pixels manually. Simply enter the respective value with the appropriate sign as specified in the table to pan the image. The factor and pixel range entries have to be set in dependence on the settings made for zooming.

### Rotation Settings

With the **Rotation** slider and its entry field you can rotate the clip full circle ( $\pm 180^\circ$ ):



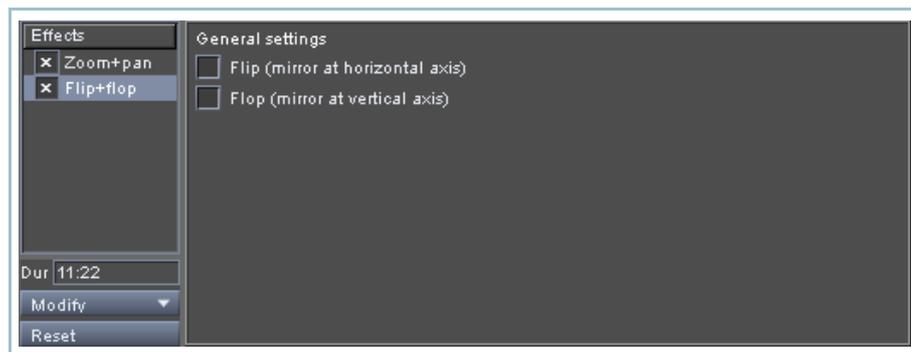
Rotation settings

By dragging the slider to the left or entering a negative value in the entry field you can rotate the image counter-clockwise and by dragging the slider to the right or entering positive values you can rotate the image clockwise.

Slider	Slider Movement	Rotation	Entry Field Values
Rotation	left		negative
	right		positive

### The Operator 'Flip+flop'

The flip/flop operator enables you to mirror the video image vertically and/or horizontally.



Flip/flop operator

The following settings are available on the flip/flop operator:

Setting	Meaning
<b>Flip</b>	When this check box is enabled, the clip's images will be flipped along the horizontal axis thereby turning the pictures upside down.
<b>Flop</b>	Activating this check box mirrors the images in horizontal direction, i.e. the images are mirrored along the vertical axis.

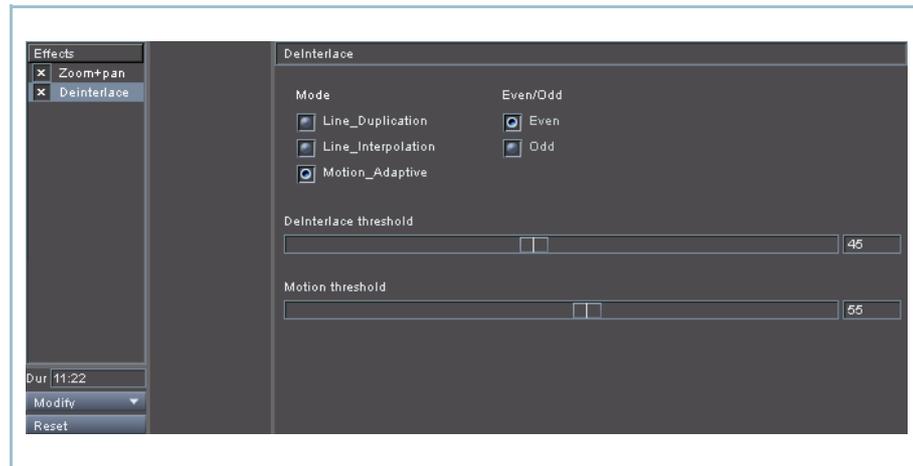


## The Operator 'Deinterlace'

The operator 'Deinterlace' enables you to convert interlaced material (fields) on your system into the progressive image format (frames).



If the deinterlace operator is used on a clip, it has to be prerendered prior to a playout.



Deinterlace operator

This section describes in detail the settings provided by this operator.

The items available under the heading **Mode** determine the method used for the deinterlacing.



<b>Line_Duplication</b>	This mode simply duplicates in the images the lines selected in the <b>Even/Odd</b> area, meaning either the odd or the even lines of an interlaced field will be doubled to get rid of the interlacing. The method of doubling lines is most suited when your clip contains no moving objects.
<b>Line_Interpolation</b>	The effects of the line interpolation method are almost identical to the ones of the line duplication. Every second line in the image is dropped and replaced by an interpolation of neighboring lines. Thus slow moving objects in your clip will most likely be rendered with a good result because differences between two lines are calculated and averaged out.
<b>Motion_Adaptive</b>	This mode will yield good results when your clip contains moving objects because motion in the clip's images is detected automatically. A line interpolation will be applied only when interlacing effects are found. This mode provides best quality and does not lose general resolution as only in fast moving parts an interpolation is applied.

The items of the **Even/Odd** area are used to determine the starting field for the calculated result:

<b>Even</b>	The even numbered lines (starting with line 0) are used as the starting field for the application of a deinterlacing. All odd numbered lines remain unaltered.
<b>Odd</b>	The odd numbered lines (starting with line 1) are used as the starting field for the application of a deinterlacing. All even numbered lines remain unaltered.

With the sliders below the previous settings can be refined:



<b>DeInterlace threshold</b>	This slider sets the deinterlacing threshold for the selected modes. It is used to detect whether interlacing is present in the images. Decrease this parameter in case moving objects in your prerendered result still contain some interlacing effects. The lower the value the more pixels are deinterlaced.
<b>Motion threshold</b>	This slider sets the motion threshold for the selected methods. It is used to detect regions with moving objects in an image. By decreasing this parameter you apply the deinterlacing to a larger area in the images. Use it in case interlacing effects are still visible in your prerendered results.

## Color Correction Operators

The Color Correction Operators are used to perform a color and gamma correction of the clip currently selected in the timeline.

Color Operators	Description
1st color correction	Operator for a primary color/gamma correction. Additionally, you can assign a static look-up table (LUT) to clips and thus perform a color and/or gamma correction with a single file.
Picture masks	Picture masks allow the usage of an effect on a selectable part of a clip only. The part of the images that will be affected can be set with freely definable shapes (masks).
Raw decode operators	Special operators to color correct the raw data of the material coming from certain cameras. See also section "Working with JPEG2000 and Raw Content" on page 25.



Further information on the color correction operators can be found in chapter "Color Science" (page 237)

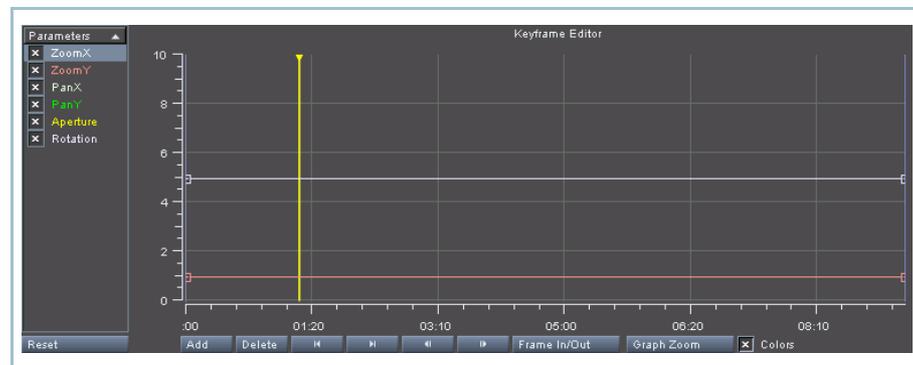
## Keyframing

For effects there may be keyframing available. It allows you to use the effect on a clip's timeline with definable points of settings (keyframes). With this you can easily configure, for instance, smooth transitions between these effect's settings, for example, to fade in the effect during a playout of the clip.

The check box **Keyframing** below the rotation and zoom and pan settings activates keyframing for those effects.

### Keyframing Overview

Once activated for the respective effect, the keyframe editor will be displayed in the settings pane of the effect:

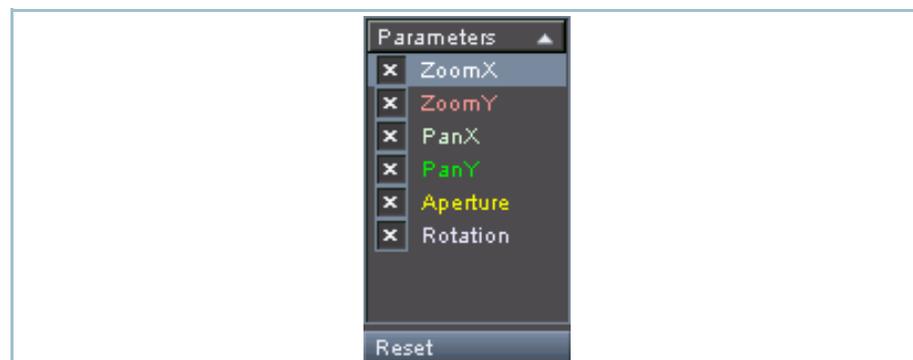


Keyframe editor

With the keyframe editor a keyframing of the effect's settings can be set. On the left hand side you can find a list of the effect's settings that can be used for a keyframing. On the right hand side the graph of the keyframe editor is displayed where a keyframing can be configured.

### The Parameters List

To the left of the keyframe editor you can find the Parameters list. It lists all settings of the effect that can be used for a keyframing:



Parameters list



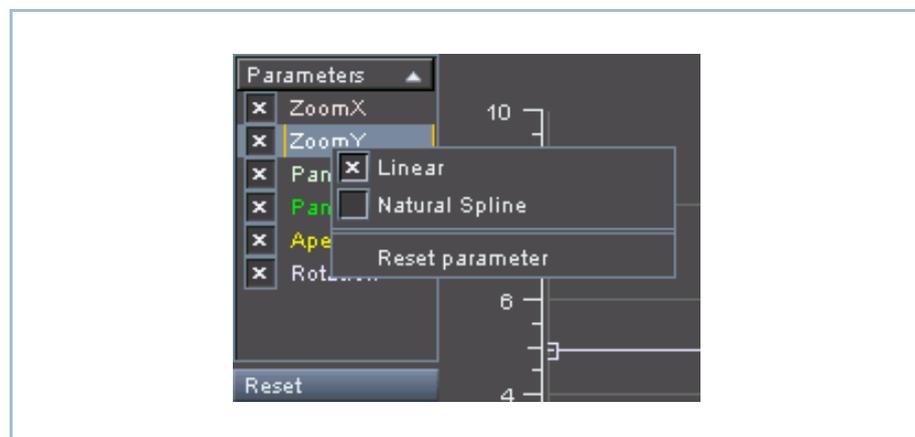
For each effect setting in the list there is one keyframing line available in the graph of the keyframe editor. In the default view of the keyframe editor they are color coded, meaning each setting is displayed in a different color and you can easily identify the keyframing line belonging to a setting because they are drawn in the same color.

However, due to the fact that most effect settings have default values of either one (e.g. 1.000) or 50%, their respective keyframing lines may overlap each other in the graph. With the list of parameters you can select the setting that should be keyframed: When selecting a setting from the list, you can click on the stack of keyframing lines in the graph and create a keyframe for this particular setting (even if others are visible on top of it). However, this works only as long as there is no other keyframe available at this location. In case you accidentally selected another stack of lines, the keyframe will be created instead on the keyframing line first available from the top of the parameters list.

You can see the selected keyframing line and whether others are on top of it more clearly with the check box **Colors** deactivated. Then the keyframing lines are displayed without color coding, except for the currently selected line which will be highlighted in blue (as long as no other lines are on top of it).

The check boxes in front of the settings in the parameters list allow you to display or hide keyframing lines in the graph. If the check box in front of a setting is activated, its keyframing line is displayed; if deactivated, it is hidden. With this you can display only those keyframing lines in the graph where a keyframing should be performed.

Additionally, the settings entries of the Parameters list provide the following context menu:



Context menu of parameters list

**Linear**  
**Natural Spline**

These settings determine the curving of the keyframing line of the selected setting. You can toggle between them. With **Natural Spline** activated the keyframing line will be curved between the keyframes, with **Linear** it will be straight from keyframe to keyframe. To activate **Natural Spline**, at least one additional keyframe has to be set on the keyframing line of the selected setting.

**Reset parameter**

This menu option resets the selected setting of the parameters list. It removes all additional keyframes from the keyframing line, restores its default values and sets it back to **Linear**.

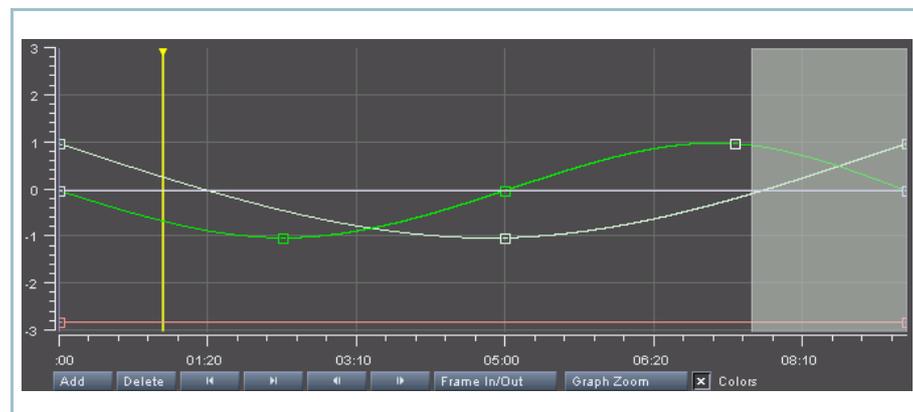
The button **Reset** sets all settings of the parameters list back to their default values and states, i.e. all additional keyframes will be removed from their keyframing lines, their default values will be restored and their curving will be linear again.

**Viewing the Graph**

Because an effect is valid for a single clip in the timeline, the graph of the keyframe editor usually shows the timeline of the selected clip. Nevertheless, it can be set to a viewing/zooming of your needs.



When trimming a clip in the timeline while the keyframing editor is visible, the trimming will be displayed in the graph: the trimmed parts will be shown dimmed with a blue hue.



Graph



To work on a selected part of a clip, you can use the button **FRAME IN/OUT**: Set the timeline's in- and outpoint to the part you want to zoom into and press this button. The graph will then display the selected part only.



The graph will show the timeline's in- and outpoint same as the timeline: Any deselected part will be displayed in a dimmed fashion.

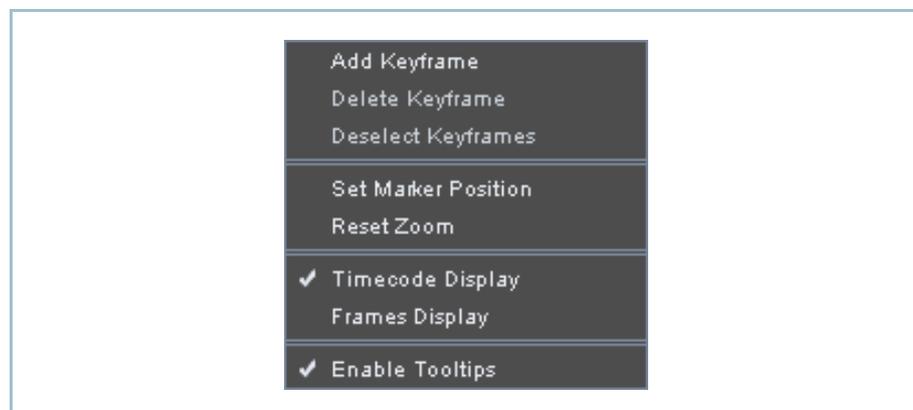
A zooming can also be performed with the button **Graph Zoom**: Pressing this button while moving with the mouse to the right or left allows you to zoom in and out of the graph. Alternatively, instead of the button you can also use the keyboard combination [Shift + Ctrl] (then move the mouse). The zooming will be made on the current viewing position.

In case you want to view a particular detail, you can hold down the [Ctrl] key and draw a (yellow) rectangle with the mouse around it in the graph. Once the mouse button is released, the view of the graph will be adjusted to the width of the drawn rectangle.

When zoomed into the graph, a scroll bar will be available at the top of the graph which allows you to change the viewing position on the graph's timeline. You can also hold down the keyboard keys [Shift + Alt] and move the mouse to the right or left to change the viewing position.

As long as the graph has the focus, you can reverse a zooming and step between previous views on the clip's timeline with the keyboard keys [Page Up] and [Page Down].

The viewing/zooming can also be set back to the full view of the clip's timeline again. For this you have to use the context menu of the graph:



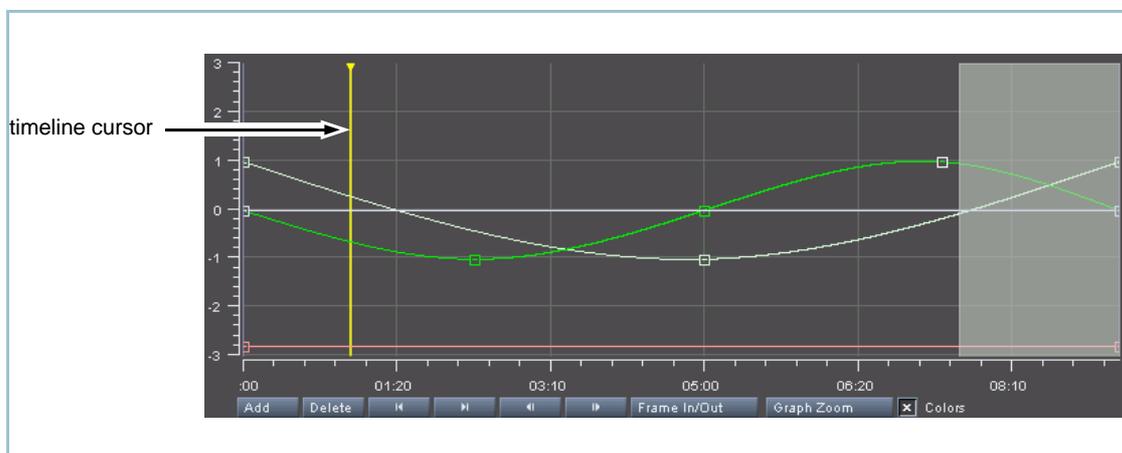
Context menu of the graph

On the graph's context menu select the menu option **Reset Zoom** to reset the view of the timeline.

Furthermore, the context menu provides the possibility to switch the notation of the graph's scale. For this select from the context menu either the **Timecode Display** or **Frames Display** menu option. This will change the notation of the graph as well as of all position and length indicators in the software module.

### Moving within the Graph

The graph provides a cursor same as the timeline cursor of the Edit Tool. They are connected to each other, meaning when one of them is moved, the other one will move accordingly. This way you can move in the graph directly and see the effect of a keyframing in the overlay immediately.

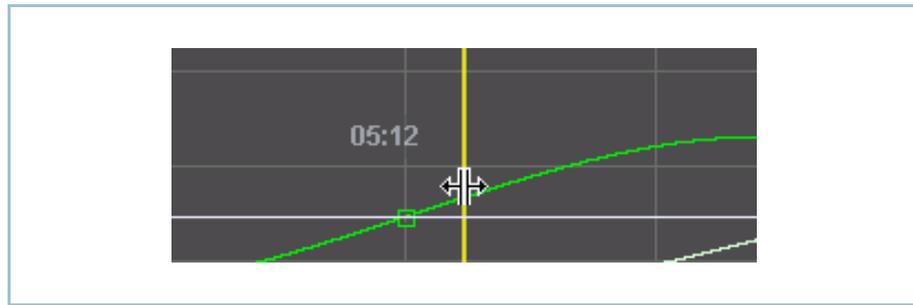


Timeline cursor in the graph

To position keyframes or review their effect, you may want to move the timeline cursor in the graph. There are several ways to do this:

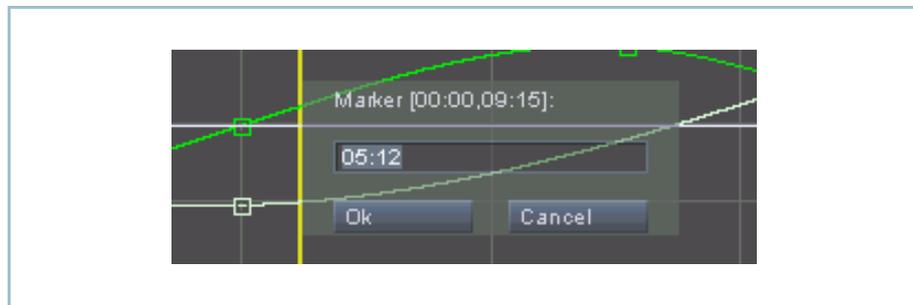
- You can click anywhere with the mouse in the graph and the timeline cursor will be positioned there immediately.
- The timeline cursor of the graph can be scrubbed the same way as you can scrub a scrub bar/timeline of the DVS software.
- You can use the controls of the Edit Tool as usual to move in or play out the timeline. The cursor of the graph will be moved accordingly.

When moving the graph's timeline cursor with the mouse, its exact position is displayed to the left of the cursor.



Exact positioning 1

Additionally, you can move the timeline cursor with the menu option **Set Marker Position** of the graph's context menu. It will open a small window in the graph where the position of the timeline cursor can be entered.

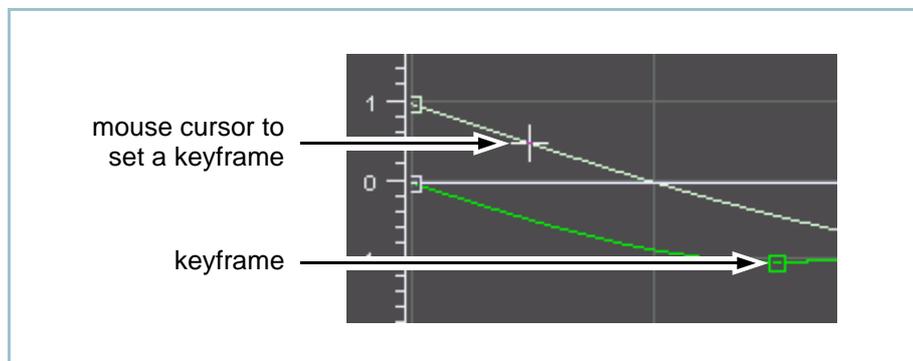


Exact positioning 2

The range of possible values that can be entered is indicated in the window in square brackets. Once a correct position is entered, the marker can be positioned there exactly either by using the **OK** button of the window or by pressing [Enter].

### Setting and Positioning Keyframes

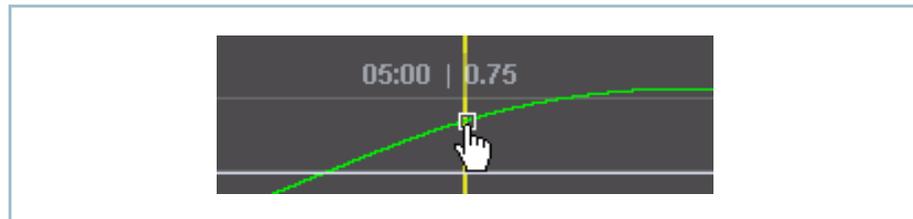
Keyframes for an effect setting can be set easily in the keyframe editor: A single click on the respective keyframing line of the setting in the graph will create a keyframe.



Creating keyframes

Additionally, with the menu option **Add Keyframe** of the graph's context menu you can create a keyframe for the setting that is currently selected in the parameters list. The keyframe will be created at the position of the timeline cursor.

Once a keyframe is created, it can be moved and positioned freely with the mouse:



Positioning keyframes

During the moving of a keyframe with the mouse, its position and setting is displayed on the screen, allowing you to accurately position and set the keyframe.

Each keyframing line represents a setting of the effect. Thus, to set and adjust a keyframe you can also use the settings of the effect directly. Simply select one of the settings items in the settings pane of the effect and a keyframe will be created on the respective keyframing line at the position of the timeline cursor. Then it can be adjusted to your needs with the settings item of the effect directly.

The settings items of the effect can also be used to adjust already available keyframes. For this position the timeline cursor of the graph on a keyframe and then use the settings item in the settings pane of the effect to change the keyframe.

An already created keyframe can also be adjusted precisely in the graph with a double-click of the mouse on a keyframe. This will open a small window in the graph where the setting of the keyframe can be entered.



Exact positioning of keyframe



The range of possible values that can be entered is indicated in the window in square brackets. Once a valid setting is entered, the keyframe can be precisely set either by using the **OK** button of the window or by pressing [Enter].



# Color Science

This chapter provides background information on how to work with color spaces and encoding ranges as well as how to apply color effects when mastering video content with CLIPSTER.

The chapter is divided into the following sections:

- Encoding Ranges (page 238)
- Primary Color Correction (page 253)

## Encoding Ranges

This section describes the Head and Full encoding ranges.

The following topics are covered:

- Understanding Head/Full Range (page 238)
- Head/Full Range within the CLIPSTER Concept (page 242)
- Outputting the Correct Range (page 247)

### Understanding Head/Full Range

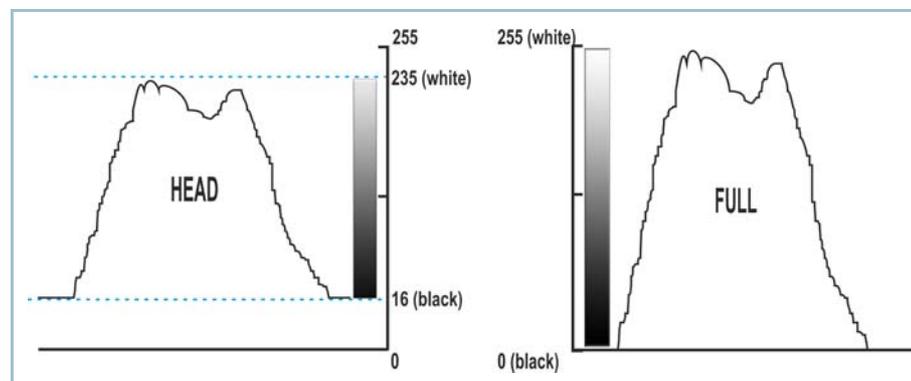
Head/Full are terms describing two different encoding ranges that influence the luminance of an image.

The Head range - also referred to as limited range - does not utilize the entire range of the signal, but reserves footroom below the reference black value and headroom above reference white values. This is a holdover from the days of analog transmission where parts of the analog signal were reserved for metadata, and no pixels could contain values outside of the “legal” range. e.g. in combination with analog video equipment (such as TV).

#### Limitation of value ranges

	Black	White
8 bit	16	235
10 bit	64	940

Full range uses every value between 0-255 / 0-1023 to represent luminance. Typically, this full-range format is used for JPEG image processing and computer based applications.



Head/Full color value ranges (8 bit data)

Depending on the use case and the target device, the values of the video content may have to be converted from a full range to the restricted range or vice versa. For example, most Digital Intermediates are done with Full range data, but deliverables might be expected in Head range. On the other hand, when processing a scene in post production, you will most likely work with full-range RGB files. For broadcast, the images have to be constrained within "Legal" range for the broadcast signal to account for tolerances and a possible signal overshooting that may occur during the sampling of analog video signals.



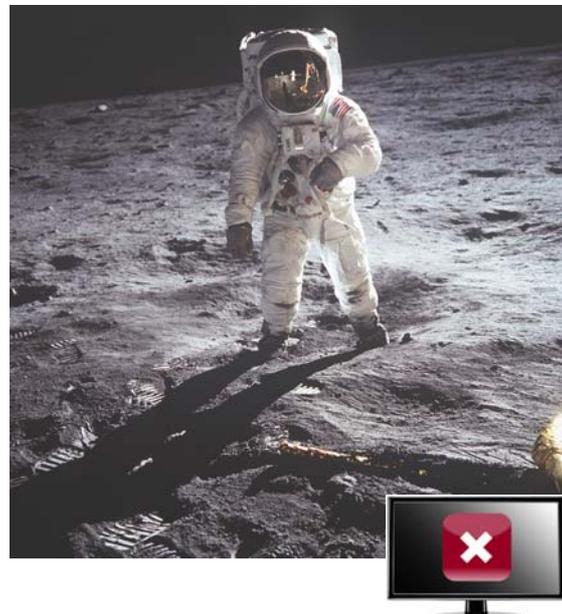
It is important to know which is the use case. Usually, video content in post production is processed in the Full range, in order to work with the highest quality data, and then down-scaled to Head range for TV broadcast. However, if the source is falsely converted or displayed on the wrong output screen, several display errors can occur.

**Scenario1:**  
**Head range**  
**on different**  
**screens**

If a Full range monitor displays a head range image without properly remapping the values, it will result in a washed out image on the display.



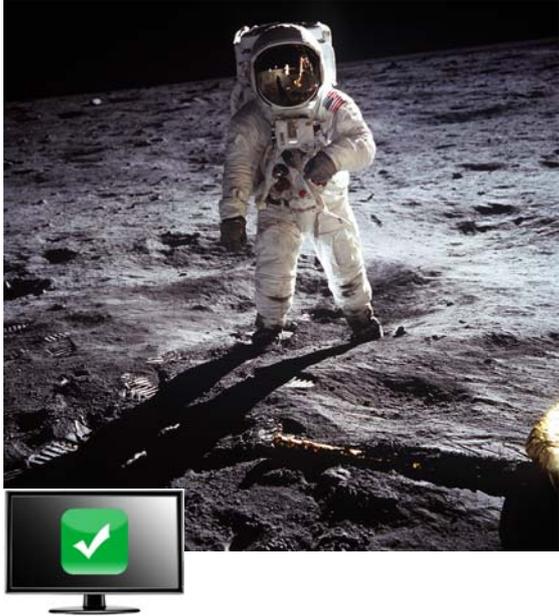
Head range monitor



Full range monitor

**Scenario2:**  
**Full range**  
**on different**  
**screens**

If a Head range monitor displays a Full range image without properly remapping the values, it will result in a high contrast image on the display.



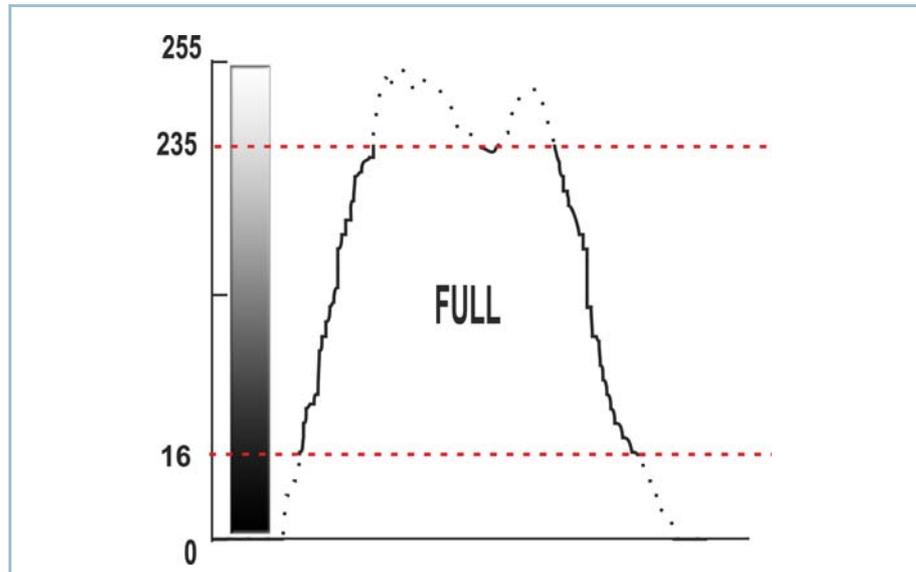
Full range  
monitor



Head range  
monitor

**Scenario3:**  
**Full range**  
**clipped to**  
**Head range**

When Full range content is clipped to Head range, instead of mapped to Head range, the result is a loss of detail in both the shadows and highlights regions.



Clipping

The image looks wrong no matter the type of screen it is displayed on:



Clipped image - loss in detail

## Head/Full Range within the CLIPSTER Concept

In CLIPSTER the range output settings can be set to Full or Head in the Finalizing Tool, the IMF Delivery Tool as well as in the Timeline output settings. Changing this setting directly in the Timeline will also affect the immediate playout result.

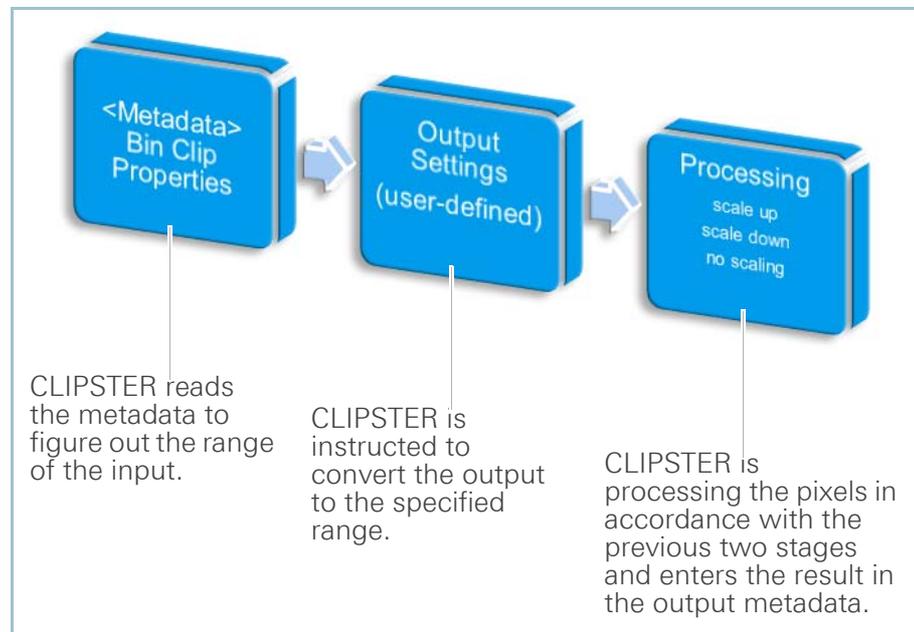


You can set the output range in the Finalizing Tool as well as in the IMF Delivery Tool, stage Video. All other Delivery Tools have predefined output ranges as they have to conform to a specific standard.

When loading a project, the software performs no automatic detection of the range of the loaded video content. In order to determine the value range CLIPSTER reads the metadata of the video file after it has been loaded into the Bin. However, in some cases the metadata may not be discerned correctly and then you have to manually alter the range.

How the pixels are processed in CLIPSTER during conversion depends on the following factors:

- 1 the range indicated in the input file header
- 2 the range specified by the user in the output settings (Timeline or Delivery Tool)





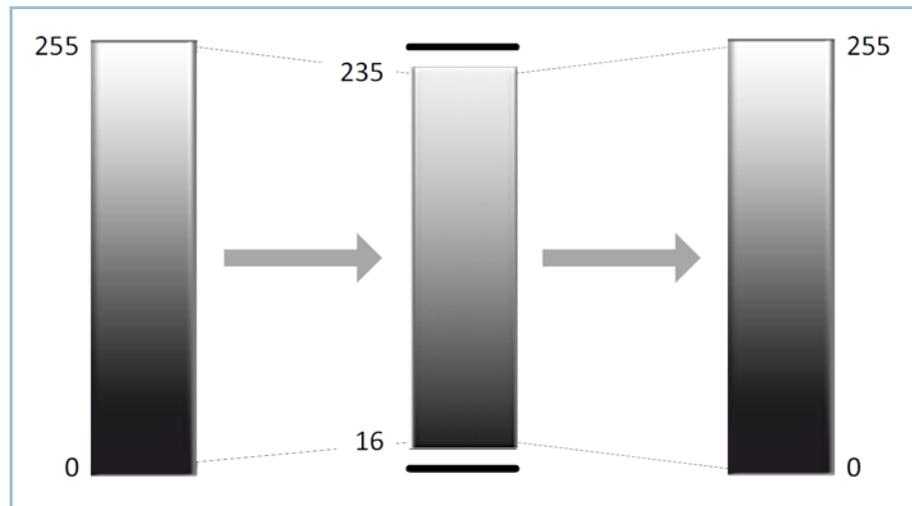
Thus, depending on the settings the software either scales up or down (input - output), or applies no changes. Further, after the conversion CLIPSTER enters the output range in the output file header, in order for the subsequent video equipment to know how to display the content.

The following conversion variants are then possible:

Input Property	Output Setting	Processing
Full	Full	No scaling
Full	Head	Scaling down
Head	Head	No scaling ( <b>Note:</b> can be clipped if converting between YUV and RGB)
Head	Full	Scaling up

The process of scaling involves the remapping of the encoding values to the reference black-to-white scope of the other range:

- No scaling - 0=0, 255=255 or 16=16, 235=235
- Scaling down - 0 mapped to 16, 255 mapped to 235
- Scaling up - 16 mapped to 0 and 235 mapped to 255

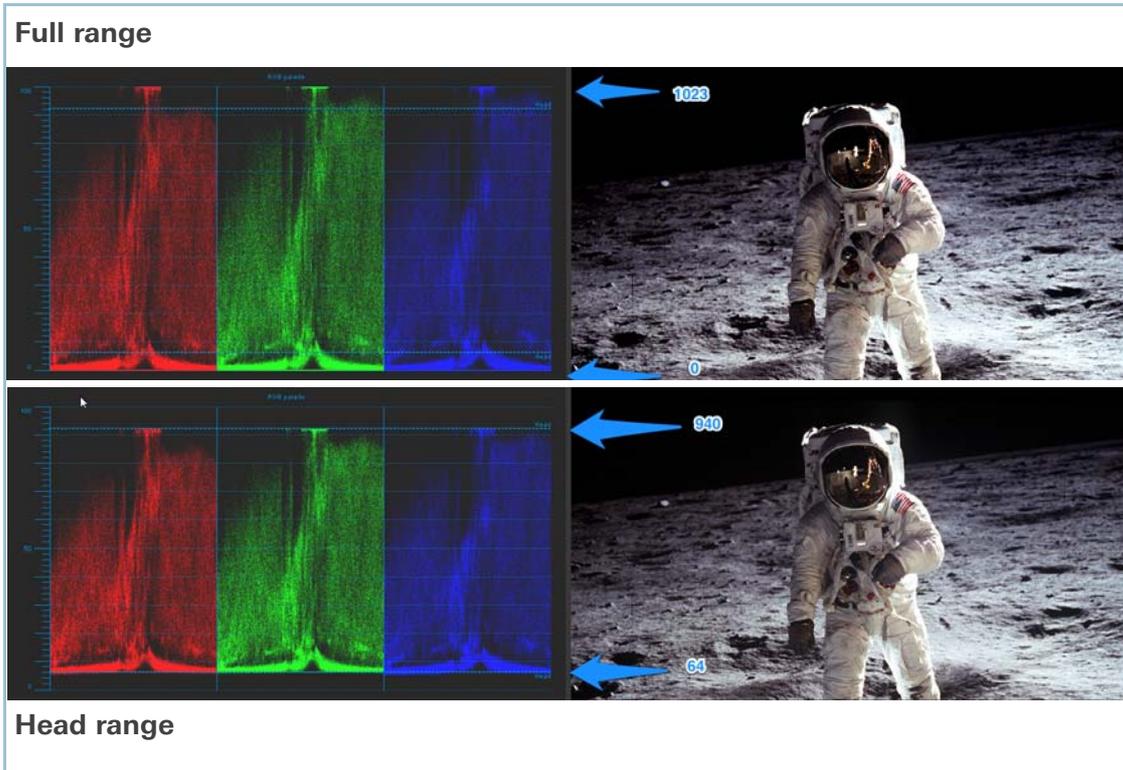


Remapping the color value ranges



If no scaling is desired, meaning the source range remains in the output as it is, you can output Full - Full. CLIPSTER will not process the pixel data in that case. However, the file will be then stamped as full range. Beware that a file that has a Full range flag in it will almost always be scaled down to head when output as a video file that requires Head range.

Both ranges are graphically best represented in CLIPSTER using the RGB Parade Analyzer (right-click on the video overlay to open the submenu then select **Analyzer > RGB parade**):



Full/Head range display in RGB Parade Analyzer

**NOTICE**

**Incorrect metadata**

To output video without introducing additional artifacts, both the source properties, and desired destination properties must be known.

If the range of the input file is incorrectly set in the bin clip properties, meaning it is different from the actual pixel data, depiction errors will occur during any pixel processing.

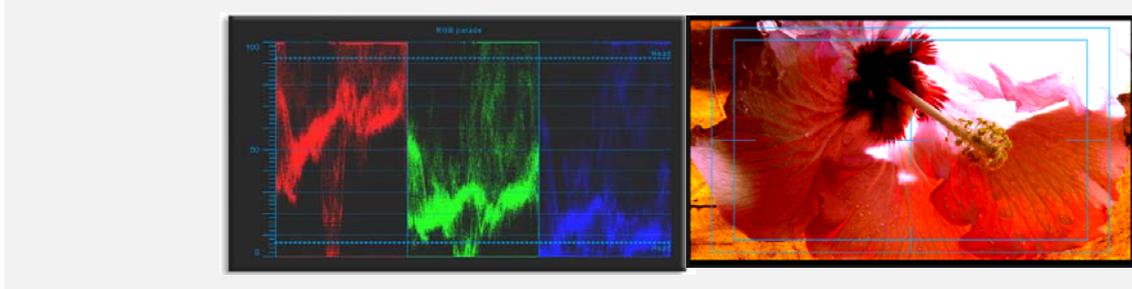
**Always make sure that the range setting in Bin Clip Properties is accurate. If CLIPSTER works with false metadata, you will get undesirable results resulting from incorrect processing.**

The following depiction errors will occur in case the pixel data of the input file does not match the initial metadata entry:



Actual pixel data	Input File Header	Output setting	Processing	Output pixel data	Output File Header	Resulting image interpreted by its metadata
Head	Full	Full	None	Full	Full	Low contrast:
Full	Head	Head	None	Full	Head	High contrast:
Head	Full	Head	Scaling down	Head remapped to Head	Head	Extra low contrast:

Actual pixel data	Input File Header	Output setting	Processing	Output pixel data	Output File Header	Resulting image interpreted by its metadata
Full	Head	Full	Scaling up	Full remapped to Full	Full	Clipping, extra high contrast:



In the first two error cases CLIPSTER does not process the pixel data, however, the metadata entry of the output file is false and the file will be erroneously interpreted on the target screen. What happens in the next two cases is that the software scales down/up once more the color values which doubles the low contrast/high contrast false depiction.

## Outputting the Correct Range

To avoid outputting video files with problematic ranges, the user must basically observe the following steps:

- 1 If unsure whether the range specified in the input header file of the source is the correct one, find out its actual range.
- 2 Set the correct range through the Bin clip settings to alter the source metadata.
- 3 Set the desired range of the output while taking into account the target screen the output file should be displayed on.

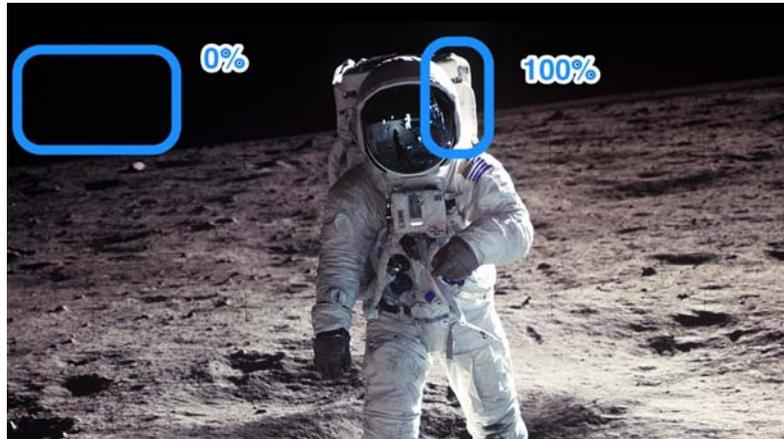
### Define the Range of your Source File

First, the actual range of the source file has to be defined. This is done by outputting the source file without any scaling and observing the result in the RGB Parade Analyzer.

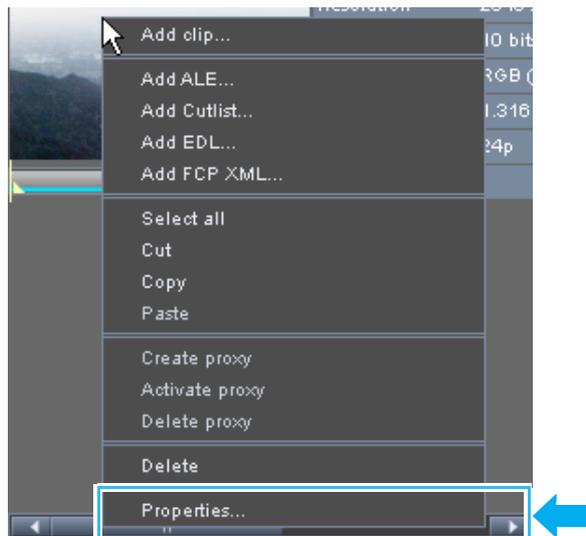
Voraussetzung: ✓ The source file has been already loaded into the Bin.

Perform the following steps:

1. Find a scene within the video content that has high contrast, containing a good amount of picture that is 0% luminance, and enough that is 100% luminance.

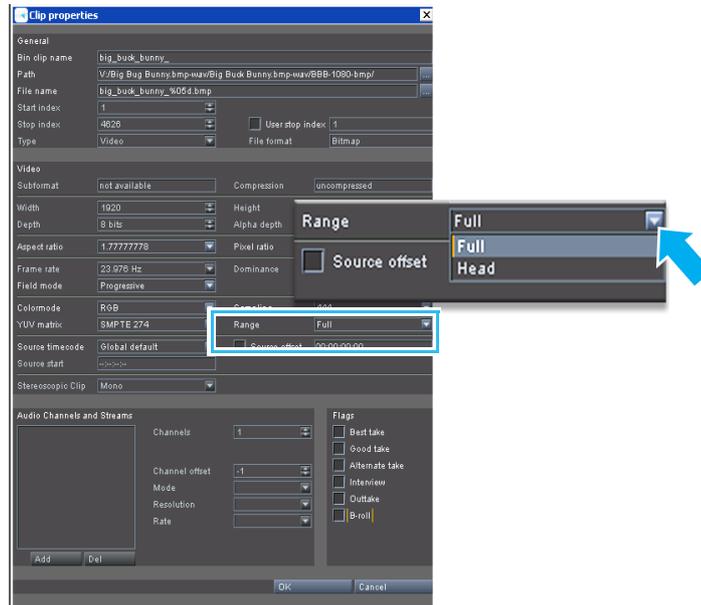


2. In the Bin, open the clip properties via **Right click on the clip > Properties.**

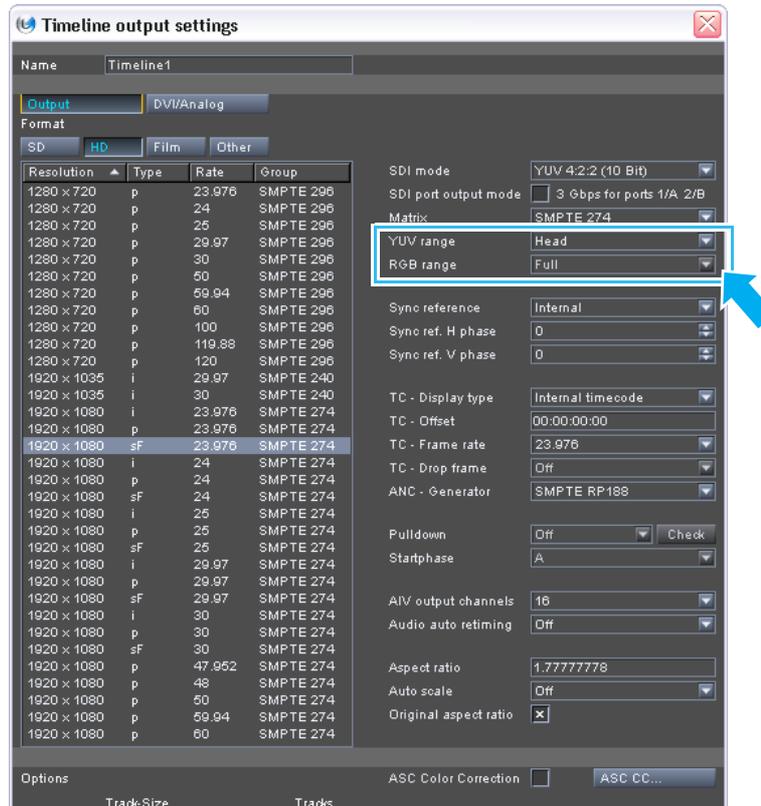


▶ The CLIP PROPERTIES window opens.

3. Set item RANGE to **Full**.



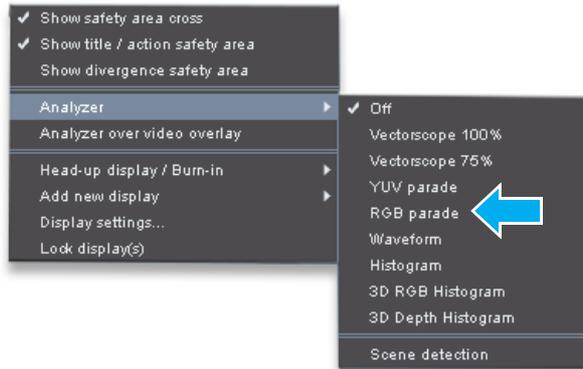
4. Click the **Settings** button in the timeline to open the **TIME-LINE OUTPUT SETTINGS** and set the range to **Full** (YUV/RGB).



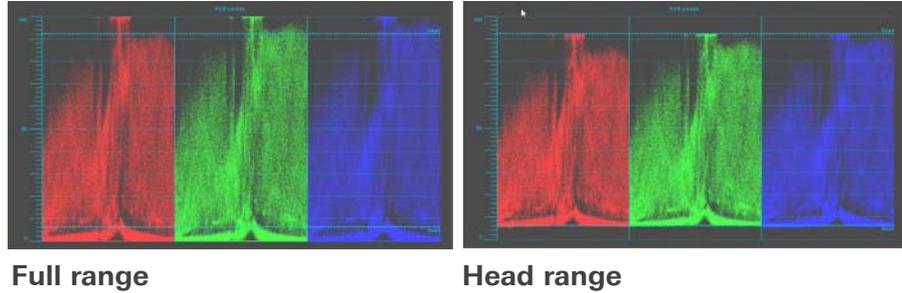


The parameters are now set in such a way that no scaling (input - output) is performed. Thus, a waveform depiction of the image data will now display the actual range of the source pixel data.

5. Open the RGB Parade Analyzer for that file via right-click on the video overlay to open the submenu then select **Analyzer > RGB parade**.



6. Now check the depiction to determine which is the original range:



The actual range of the source file is now known.

### Set the Correct Range of your Source File

Subsequently, the correct range thus defined has to be manually entered in the input header file of the source file.

Perform the following steps:

1. Open again the Clip properties in the Bin.
2. Manually set the metadata property **RANGE** to match the range of the source detected in the previous instruction.



The correct range of the source file is now set.

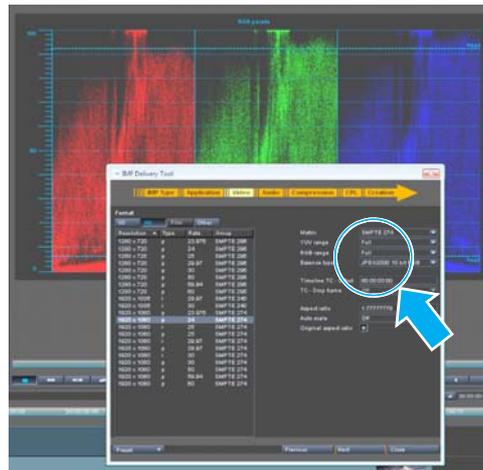
### Set the Correct Output Range



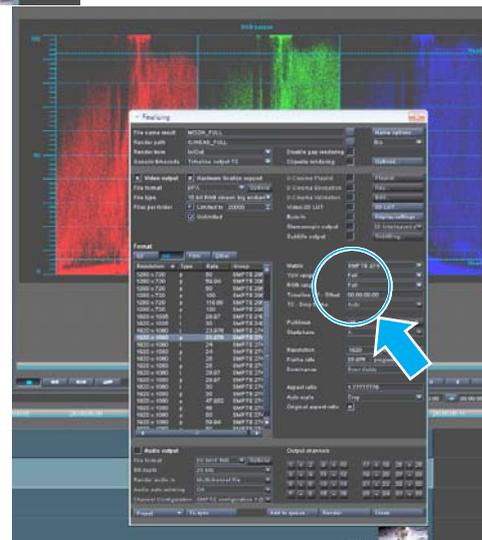
You can set the output range in the Finalizing Tool as well as in the IMF Delivery Tool, stage Video. All other Delivery Tools have predefined output ranges as they have to conform to a specific standard.

Perform the following steps:

1. Before setting the output color range, consider the target screen the video should be displayed on, see also "Understanding Head/Full Range" on page 238.
2. Set the desired output range:



In the IMF Delivery Tool



In the Finalizing Tool



Always set both YUV/RGB to your desired setting.

Once you are done creating your new file, you can always check to make sure you've done it correctly by verifying that the source clip properties are interpreted correctly by CLIPSTER, by adding it to the Bin and performing the above steps again.

# Primary Color Correction

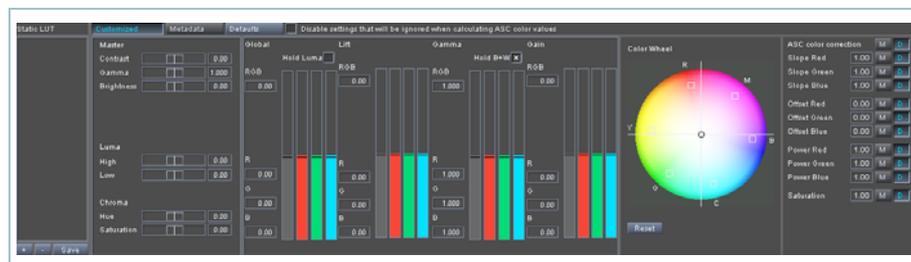
This chapter describes how to perform a primary color and gamma correction, also called '1st color correction'.

The following topics are covered:

- Overview (page 253)
- Static LUT (page 253)
- Tabs (page 255)
- Master / Luma / Chroma (page 255)
- Global (page 257)
- Lift / Gamma / Gain (page 258)
- Color Wheel (page 259)
- ASC Color Correction (page 261)

## Overview

The operator '1st color correction' can be used to perform a primary color and/or gamma correction on the currently selected clip in the timeline. It provides a user interface where you can load a static LUT and several controls to adjust the colors manually:



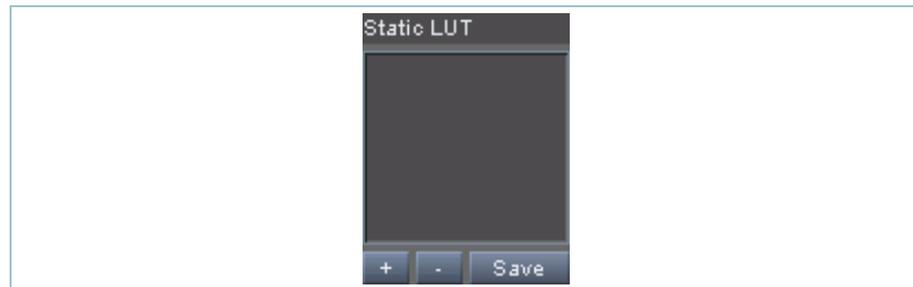
1st (primary) color correction operator

## Static LUT

With the operator '1st color correction' you can assign a static look-up table (LUT) to the currently selected clip to perform a color and/or gamma correction.



With this, only one-dimensional look-up tables (1D LUT) can be applied. 3D LUTs can be loaded and applied to the timeline via the video format settings (optional feature).



The area to set a static LUT

In the area **Static LUT** you can find at its top a list box that will contain the LUT files in the order they were selected. If the list box contains more than one LUT, the effects of the LUT files are combined to color correct the images of the clip.

Below the list box three buttons are available. With the button **+** you can load a LUT. For this select in the opening dialog window the directory path and file name of the look-up table. After this confirm your selection with the button **OPEN**. This will load the selected LUT file and its name and path will be entered in the list box above.

File extension:      \*.lut                      Look-up table  
                           \*.txt

The selected file will then be valid for the currently selected clip and a color and/or gamma correction will be performed accordingly. By repeating this action you can select and load more than one LUT file and their effects will be combined.



Several sample LUT files are delivered with the software. They can be found in the directory *lut* of the software's installation path (default: *C:\Program Files (x86)\DVS\Clipster*).

With the button you can delete an already applied LUT from the list box. Simply select an LUT file entry from the list box and press this button to delete it.

If more than one LUT file is loaded, the button **SAVE** will combine their color correction settings and create a new LUT file from the already set ones. Afterwards you can use this single LUT file instead of several ones to color correct video clips.

Once finished with the loading of a static look-up table, you can perform further adjustments to the appearance of the clip via the controls to the right of the primary color correction

## Tabs

The tabs above the settings pane of the primary color correction operator provide you with the following:

- customized settings (**Customized**)
- if available, the settings as stored in an ASC CDL (**Metadata**)
- default settings (**Defaults**)

By switching between the tabs their settings will be immediately applied to the clip and the effect can be seen in the video overlay. However, only the customized settings can be altered, the others are available for reference reasons only and cannot be changed.

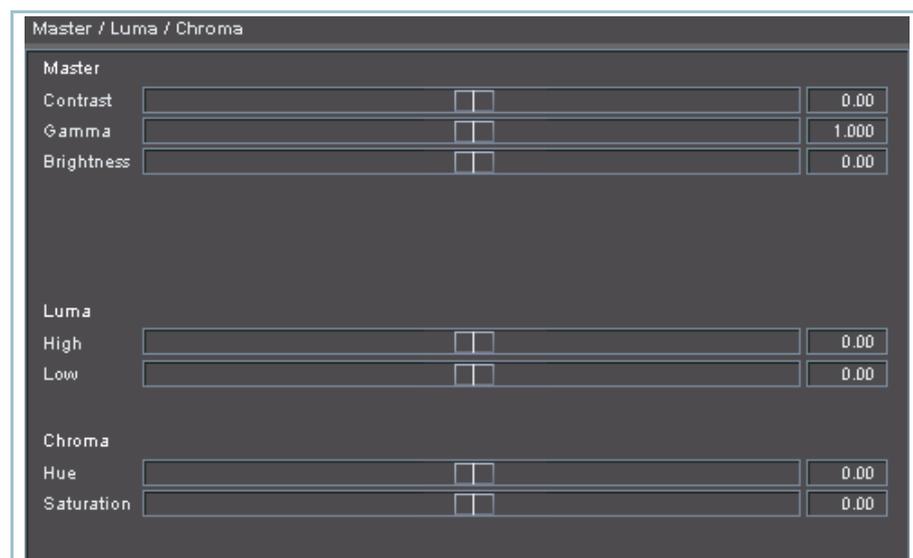


The customized settings can also be saved as a preset effect, transferred to other clips or exported as an ASC CDL.

With the check box **Disable settings that will be ignored when calculating ASC color values** you can disable the settings that cannot be used for a color correction via an ASC CDL, e.g. if you want to export the settings of the primary color correction as an ASC CDL. Already set values that will be disregarded for an ASC CDL will be set to their default setting.

## Master / Luma / Chroma

With the **Master**, **Luma** and **Chroma** items you can adjust the luminance as well as color settings:



The area for master, luma and chroma



With the **Master** items you can adjust luminance relevant settings, such as gamma or brightness:

<b>Contrast</b>	With the contrast items you can set the contrast of the clip's images. An increase of the contrast setting will push the image colors more towards their full color, whereas a decrease will adjust the colors more towards a tone of grey. You can adjust the settings between -100 (no contrast) and +100 (maximum contrast).
<b>Gamma</b>	<b>Gamma</b> adjusts the mid-tones of an image. Lowering the value will darken the mid-tones, bringing the image closer to black. Raising the value will lighten the mid-tones while bringing the image closer to white. Sometimes this setting can be used to make details visible that are usually hidden in shadows or highlights. The settings range is between 0.1 and 3 where 1 represents the unchanged image.
<b>Brightness</b>	The brightness setting adjusts the luminance of the image and indicates the bright- and darkness of the image colors. It is measured between -100 (black) and +100 (white).

The items of the group **Luma** allow you to adjust the white or black point of the clip's images:

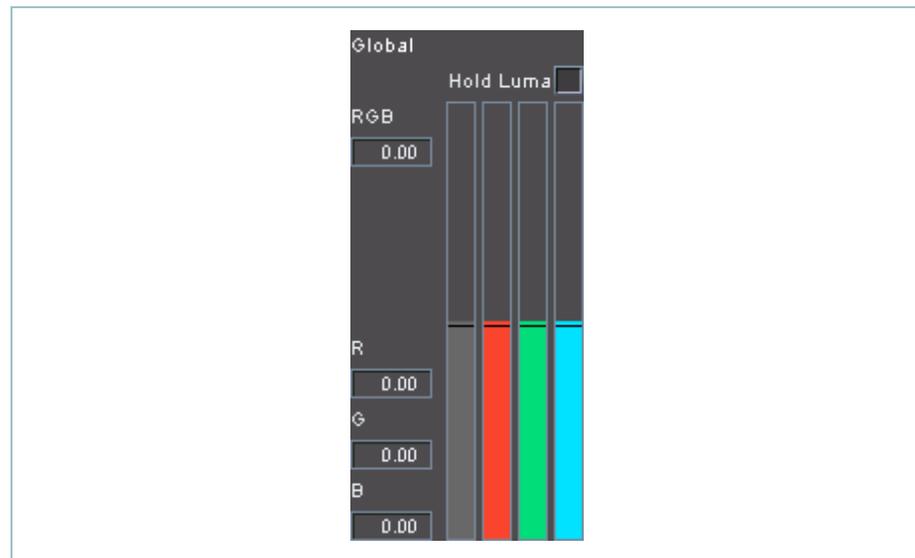
<b>High</b>	Adjusts the brighter parts of the clip, i.e. the gain or white point. By using this setting only the luminance changes, the chroma settings remain as they were. Values range from -100 to +100.
<b>Low</b>	Adjusts the darker parts of the clip, i.e. the lift or black point. By using this setting only the luminance changes, the chroma settings remain as they were. Values range from -100 to +100.

With the **Chroma** items you can adjust color related settings, such as the hue:

<b>Hue</b>	The hue setting moves the colors of the images around the color wheel in the HSL color space ( $\pm 180^\circ$ ). It is recommended to use this setting lightly for small corrections only: Adjustments greater than $\pm 10$ usually produce dramatic color changes.
<b>Saturation</b>	A color's saturation is its intensity. A higher saturation will make the color to appear richer, while a lower saturation makes it look paler, or in other words the saturation is the proportion of grey in relation to the color's hue. This setting can be set between -100 (grey) and +100 (full saturation).

## Global

The **Global** items provide you with sliders for each color value (**R**, **G** and **B**) as well as a master slider to adjust them all at once.



The global color settings

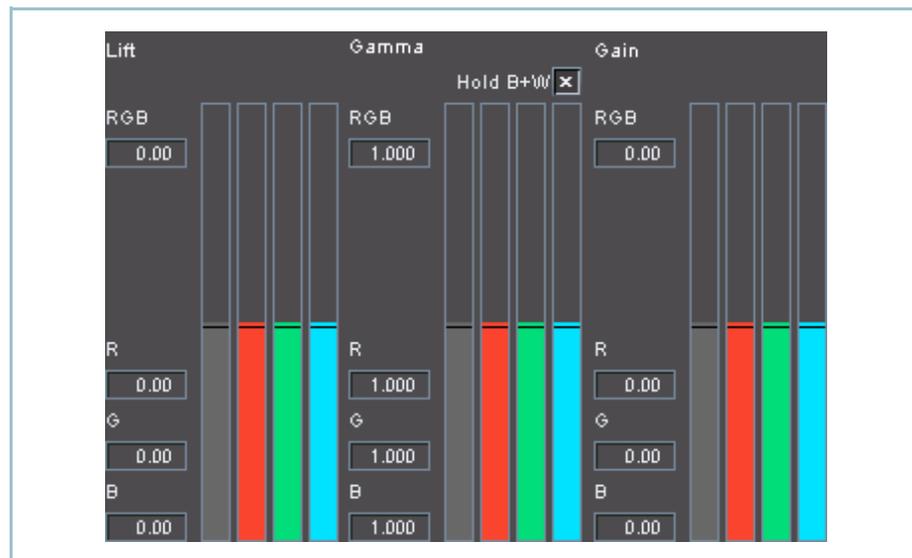
Use the sliders **R**, **G** or **B** to step up or down the color values of the image for the respective color component (red, green or blue). With the master slider **RGB** to the left you can set the settings for all three color components at once, even after already adjusting individual color components.



The check box **Hold Luma** allows you to hold the luminance level of the clip while adjusting a single color component. Usually, while adjusting a color component, the luminance of the clip is changed as well, i.e. changes occur in the **Brightness** setting, too. When this check box is activated during the adjustment of a color component, e.g. **G**, instead of adjusting the brightness parameter, the luminance of the image is set via the remaining two values (**R** and **B**) which will be set according to your changes while the luminance level is preserved.

## Lift / Gamma / Gain

To the right of the **Global** items you can find the **Lift**, **Gamma** and **Gain** items where you can adjust the individual color components in more detail. This area provides the same sliders as the previously described ones but for further accuracy they are split into the three contrast shades: lift, gamma and gain.



The detailed color settings

Use the sliders the same way as described for the global color settings. Then you can set the values for each color component of the brighter, average and darker parts of an image separately, for example, by altering the brightest parts of the image (highlights) while preserving the average and darkest parts (shadows)

<b>Lift</b>	Adjusts the darker parts of the clip, i.e. the lift or black point. Values range from -100 to +100.
<b>Gamma</b>	Adjusts the average parts of the clip, i.e. the gamma or mid-tones. Values range from 0.1 to 3.
<b>Gain</b>	Adjusts the brighter parts of the clip, i.e. the gain or white point. Values range from -100 to +100.

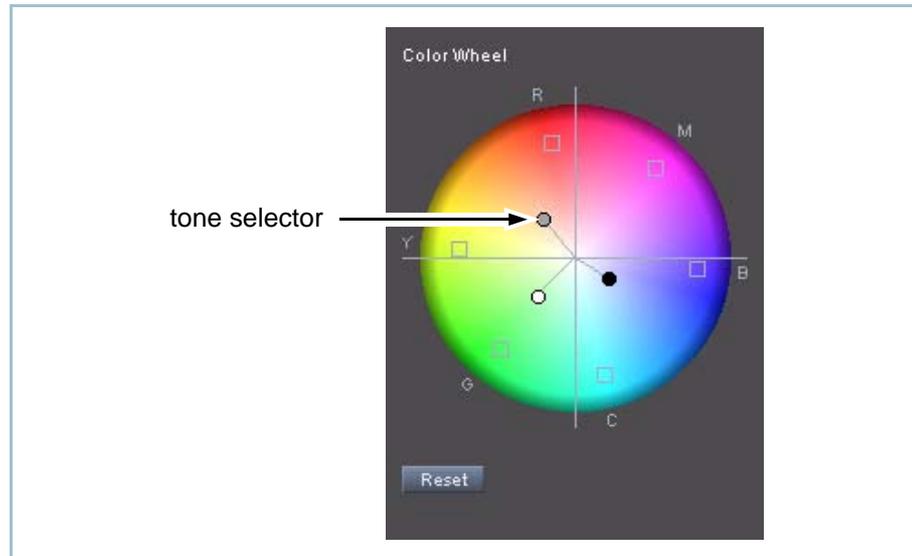
The check box **Hold B+W** allows you to hold the black and white points of the image. When it is activated, a gamma correction will be performed between adjusted black and white points. With the check box deactivated, the black and white points will be disregarded and a gamma correction will be made on the full value range of the image's color channels instead.

## Color Wheel

The color wheel contains the colors according to their hue and saturation (HSL color space), and additionally indicates color components (RGB and CMY). With the hues set on the rim of the circle, the distance from the circle's center determines the saturation of the respective color.



The color distribution in a color wheel is the same as in a vectorscope. Further information about this can be found in "Video Scopes" on page 82.



Color wheel of the primary color correction

When called for the first time, you can find in the middle of the color circle three dots that overlay each other. These are the selectors for the high-, mid- and low-tones of the image. Each can be selected individually and positioned anywhere in the circle. To select a particular tone selector when they are all located in the center of the circle, click somewhere inside the color circle with the mouse. Each click will bring another selector to the foreground.



This is the high-tone selector. It will adjust the brighter colors of the image while the luminance remains constant.



This is the mid-tone selector. It will adjust the average colors of the image.



This is the low-tone selector. It will adjust the darker colors of the image while the luminance remains constant.

When positioning a tone selector in the color circle, it will cause a color correction of the respective tones towards the color the selector is dragged to. The farther away from the center the selector is positioned, the more the saturation of that particular color increases. For example, if an image is too blue, then you would drag one or all three selectors in the opposite direction of that color, toward yellow. In case you want to pronounce a color, you would add more of the same color by dragging the selectors toward the side of the circle that provides this color.

The button **RESET** sets the color wheel of the primary color correction back to its default state.

## ASC Color Correction

The area **ASC color correction** shows you the ASC color correction settings.



ASC color correction settings

When an ASC CDL has been applied to the timeline/clip, the tab **Metadata** will be available, showing you the original settings of the ASC CDL. The settings can be set or changed on the tab **Customized** by using the provided settings items of the '1st color correction' operator.

An activated button of a setting indicates that it is currently set to the metadata (M) or default (D) value. By activating a button you can restore a setting to one of these values again. With the buttons at the very top you can change all settings in a single step. When a setting has been customized, its buttons are deactivated, thereby indicating the changed state of the setting.





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# Delivery Tools

This chapter describes the various Delivery Tools used in CLIPSTER to facilitate the content creation of the most file formats including standardized video format specifications.

This chapter describes the following tools:

- Digital Cinema Delivery Tool (page 264)
- IMF Delivery Tool (page 286)
- IMF Package Merge Tool (page 302)
- AS-11 Delivery Tool (page 308)
- Finalizing Tool (page 324)
- Forensic Watermarking (page 347)



## Digital Cinema Delivery Tool

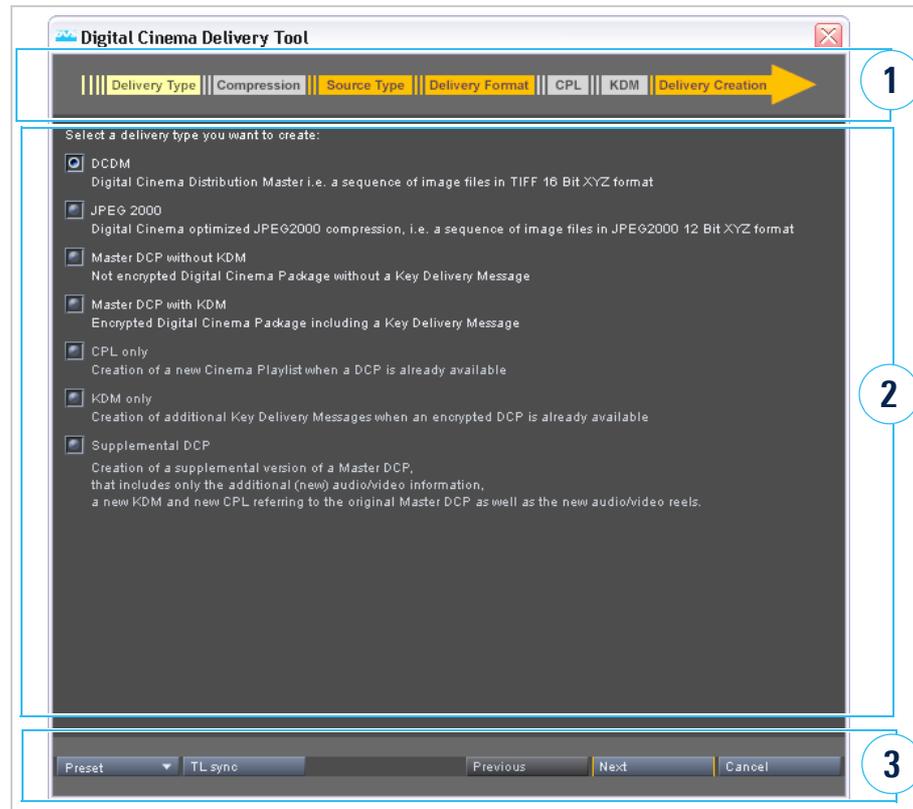
This section describes the digital cinema delivery tool used to create DCI-compliant digital cinema packages. For background information concerning the DCI Mastering feature in CLIPSTER, please refer to chapter “DCI Mastering” on page 359.

The following topics are covered:

- User Interface Overview (page 264)
- Stage 1: Delivery Type (page 267)
- Stage 2: Compression (page 270)
- Stage 3: Source Type (page 274)
- Stage 4: Delivery Format (page 276)
- Stage 5: CPL (page 278)
- Stage 6: KDM (page 281)
- Stage 7: Delivery Creation (page 283)

### User Interface Overview

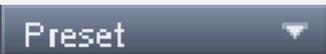
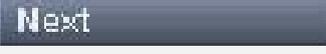
After starting the Delivery Tool via **Project » Digital Cinema Delivery Tool**, or keyboard shortcut **[Ctrl + D]**, the user interface is displayed on the screen, showing the first configuration stage:



Digital Cinema Delivery Tool first stage

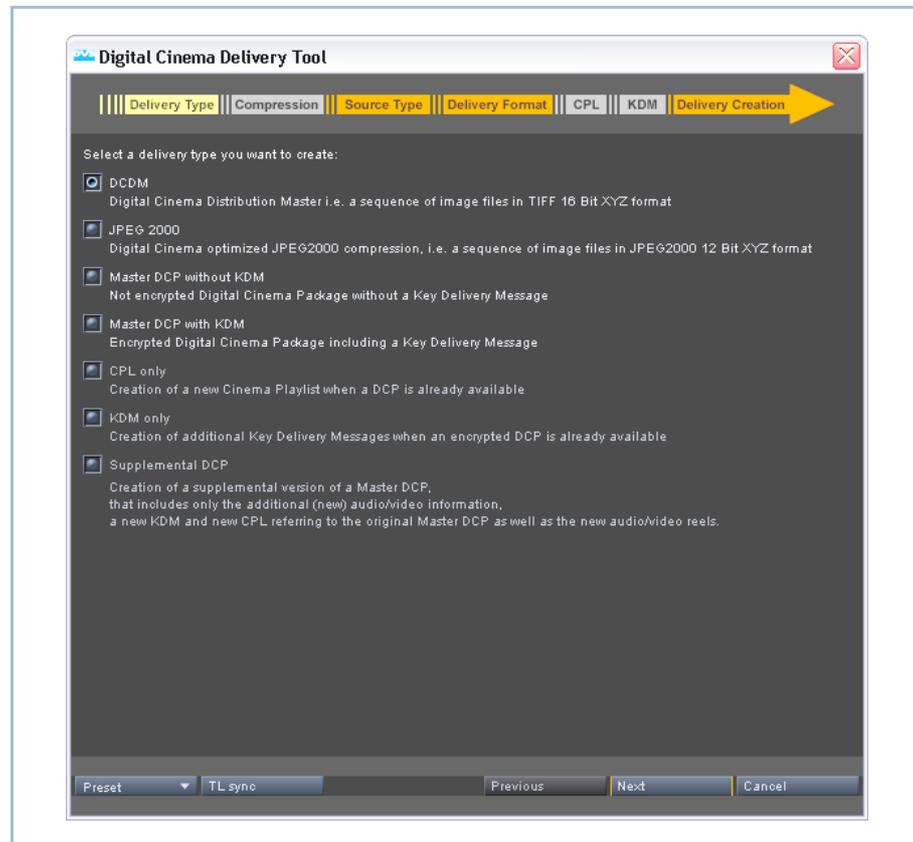
No	Item	Description
1	Configuration stages	Shows the progress of the generation settings; yellow indicates the currently active stage, orange indicates the stages that have to be performed for the selected delivery type. <b>NOTE:</b> Gray indicates a stage that is not applicable to the currently selected delivery type.
2	Settings pane	Contains the configurations that can be made for the currently displayed configuration step.



No	Item	Description
3	Button area	Buttons to control the delivery tool.
		Via presets you can save and restore the settings of the delivery tool for often recurring jobs. Via the options on the <b>Preset</b> drop-down list you can create and administer the presets, e.g. load or save them. Recently used/loaded presets will be listed as well. You can also store the current setup of the delivery tool as a default. These settings will then be available for each new project.
		Sets the Delivery Tool to the same settings as currently set for the timeline.
		Opens the previous configuration step for the currently selected delivery type
		Opens the next configuration step for the currently selected delivery type. When the last step is reached, it will change to <b>CREATE</b> , which will then start the creation of the digital cinema content.
		Adds the currently configured delivery type to a batch list for later processing. This button is available only in the last stage „Creation“
		Closes the delivery tool without creating any content. However, already specified configurations will not be lost but stored during run-time.

## Stage1: Delivery Type

Right after starting the digital cinema delivery tool, the very first configuration step will be displayed. With it you determine the type of content that should be created, i.e. the delivery type.



The delivery type settings

In the settings pane select the delivery type that you want to create by activating one of the available radio buttons. When finished you can go to the next configuration step with the button **Next**.

Depending on the selected delivery type there are different configuration steps required. The following explains shortly the available delivery types and shows the configuration steps that have to be performed for each



For the last three options an already created DCP is required.

If an MPEG compression is selected, the step to set a source type is not required.



**DCDM**

This option creates a DCDM from a DSM, i.e. a sequence of TIFF image files in 16 bit X'Y'Z' (see also section "Digital Cinema Distribution Master (DCDM)" on page 361). For this the following configuration steps are necessary:



Configuration steps for a DCDM

**JPEG2000**

This option creates JPEG2000 compressed data optimized for the digital cinema either from a DSM or DCDM in a single step, i.e. a sequence of JPEG2000 files in 12 bit X'Y'Z' (see also section "JPEG2000" on page 361). For this the following configuration steps are necessary:



Configuration steps for JPEG2000 data

**Master DCP without KDM**

This option creates an unencrypted DCP (e.g. for trailers or advertisements) either from a DSM, a DCDM or digital cinema compliant JPEG2000 data in a single step (see also section "Digital Cinema Package (DCP)" on page 362). Afterwards this DCP can be used as a master for later adaptations (supplemental DCP). For a DCP without KDM the following configuration steps are necessary:



Configuration steps for DCP without KDM

**Master DCP with KDM**

This option creates an encrypted DCP (e.g. for a feature film) either from a DSM, a DCDM or digital cinema compliant JPEG2000 data in a single step (see also section "Digital Cinema Package (DCP)" on page 362). Afterwards this DCP can be used as a master for later adaptations (supplemental DCP). In case you have an unencrypted DCP, you can use this option to encrypt it.



Configuration steps for DCP with KDM

**CPL only**

This option allows you to create the extra files of a DCP again without generating the DCP again completely (e.g. to correct typos or other delivery issues in the extra files). It will be available when a DCP (encrypted or unencrypted) has been loaded into CLIPSTER. Then the following configuration steps are necessary:



Configuration steps for CPL only

 Whether the configuration step for KDMs is required depends on whether an encrypted or unencrypted DCP has been loaded.

With this delivery type you can create additional KDMs as well (see 'KDM only' below).

**KDM only**

This option allows you to create additional KDMs without generating the DCP again completely (e.g. for later releases of the same encrypted DCP). It will be available when an encrypted DCP has been loaded. For this the following configuration steps are necessary:



Configuration steps for KDM only

**Supplemental DCP**

This option allows you to create additional material for an already generated DCP (master DCP), if feasible without generating the DCP again completely (e.g. for localizations of a feature film). It will be available when a DCP (encrypted or unencrypted) has been loaded, see "Supplemental DCPs" on page 391. For this the following configuration steps are necessary:



Configuration steps for supplemental DCP

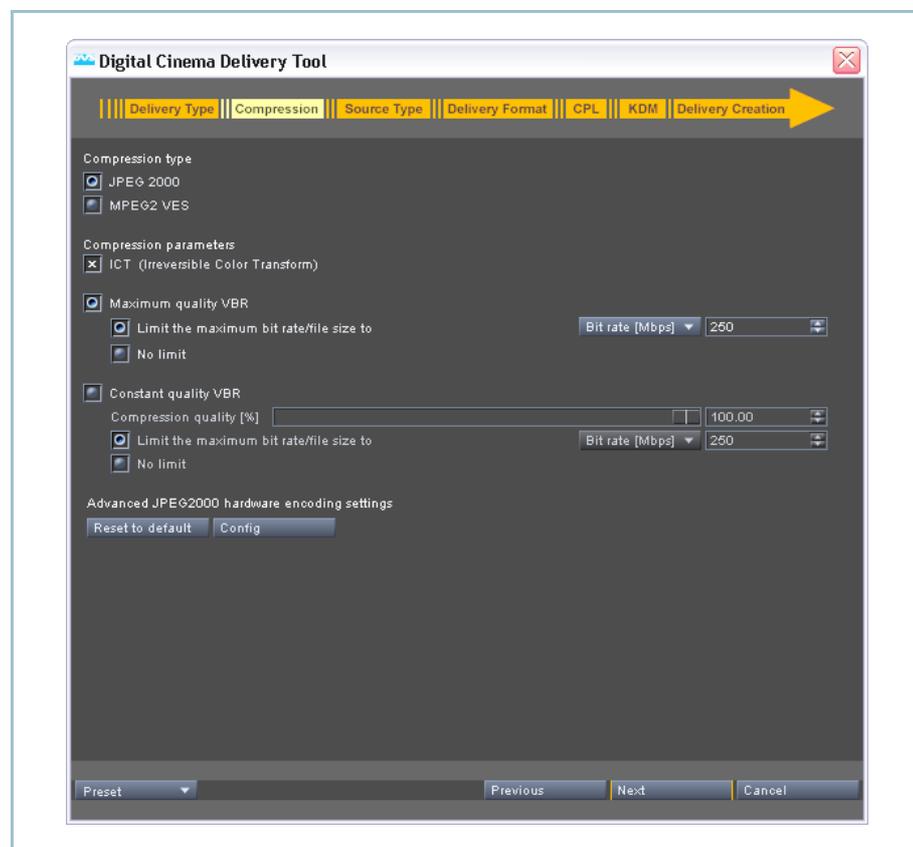


Whether the configuration step for KDMs is required depends on whether an encrypted or unencrypted DCP has been loaded.

An unencrypted DCP can be encrypted later either with the option **Master DCP with KDM** or via finalizing.

## Stage 2: Compression

With the compression configuration step you configure the compression rate of the digital cinema content:



Compression settings

At the very top of these settings you can change the compression type. By default the JPEG2000 compression is activated. However, to support alternative D-Cinema players, you can also select an MPEG compression.



## Standard JPEG2000 Settings

By default the settings for the JPEG2000 compression type are already set to the highest quality allowed for a DCI-compliant DCP (for further details about this and the JPEG2000 encoding see section “JPEG2000” on page 361). The following settings items are provided:

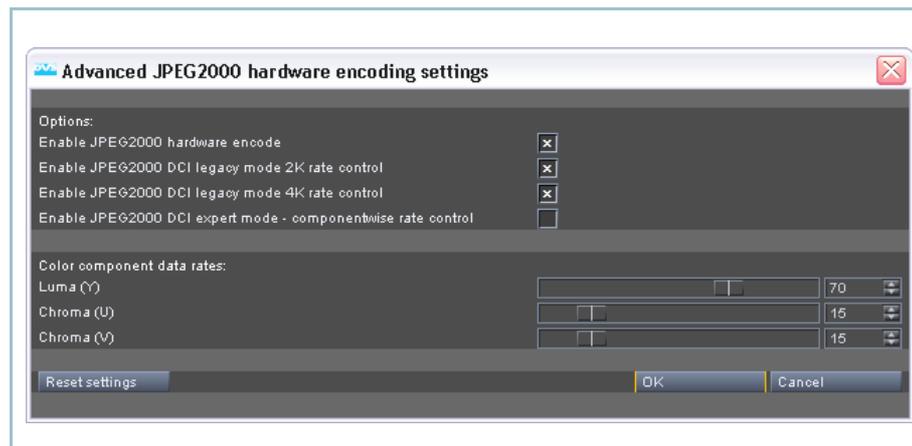
<b>ICT</b>	This setting enables the Irreversible Color Transform, meaning an internal conversion of the images' colors prior to encoding. With this the colors of the images will be encoded more efficiently. If the check box is deactivated, the original colors of the images will be used for the encoding, which would normally result in a larger file size per image, but with one of the <b>Limit the maximum bit rate/file size...</b> settings activated it will result in a lower quality of the finalized material.
<b>Maximum quality VBR</b>	<p>With this setting activated the applied JPEG2000 encoding will get the maximum quality out of each processed image. It can be specified further with the settings sorted under it:</p> <p><b>Limit the maximum bit rate/file size to:</b> This setting enables the post compression rate control (i.e. the compression of the material down to the set bit rate/file size following the JPEG2000 compression). When activated, the maximum bit rate/file size can be determined with the entry field to the right. With the item to the left of the entry field you can select whether you want to set the bit rate or the file size in the entry field.</p> <p><b>No limit:</b> This setting disables the post compression rate control, meaning a JPEG2000 compression will still be performed but without further bit rate/file size limitation, resulting in the highest quality and the largest file sizes (e.g. between 2 and 3 MB for a 2K image).</p>
<b>Constant quality VBR</b>	The constant quality VBR setting operates near the maximum quality VBR (when set to 100%). During encoding it tries to get the same quality for the complete timeline so that you will receive the same impression for each image. It can be specified further with the settings sorted under it, which operate the same way as for the maximum quality VBR (see above).



## Advanced JPEG2000 Settings

The default settings for a JPEG2000 encoding are usually set in such a way to produce DCPs that are 100% DCI compliant, thereby ensuring that they will run on all common digital cinema servers and IMBs (integrated media blocks).

To support newer technologies or formats such as high frame rate (HFR) DCPs, the button **CONFIG** of the **Advanced JPEG2000 hardware encoding settings** allows you to tune the processing. It opens the following window:



Advanced compression settings

### Enable JPEG2000 hardware encode

If disabled, the encoding is performed using software only instead of a hardware accelerated processing. Software processing is mainly used for internal debugging and should not be used in normal operation mode.

### Enable JPEG2000 DCI legacy mode...

If disabled, a special DVS rate control will be deactivated. This rate control ensures the playback of encoded DCPs on all D-Cinema players/servers. It is based on DVS's long-time DCI experience and knowledge about minor incompatibilities of some cinema players with the DCI standard. For normal 2D and 3D movies, it should always be enabled. For DCPs with bit rates higher than 250 Mbit/s (e.g. HFR 2 × 48 fps), it should be disabled.

### Enable JPEG2000 DCI expert mode...

If enabled, the color component data rates are adjustable. This allows a fine-tuning of the data allocation to luma and chroma. Depending on the images it can result in a quality increase regarding sharpness in luma or chroma values. The values are the maximum of the overall maximum data rate in percent.

Example: max. data rate 250 Mbit/s, setting 70 15 15 will result in a maximum of 175 Mbit/s for Y and maximum of 37.5 Mbit/s for U and V.

For normal 2D and 3D movies, it should always be disabled to use the optimal DCI values. For DCPs with bit rates higher than 250 Mbit/s, the sliders can be used to experiment with other luma/chroma balances.



When setting higher chrominance values than the default values 70 15 15, the DCP may not work on all DC players in the field.

For one of the first major HFR 3D projects values of 64 18 18 were chosen for the luma/chroma balancing.

The **RESET SETTINGS** button will set the **Advanced JPEG2000 hardware encoding settings** back to their default values.

In case the default values of the **Advanced JPEG2000 hardware encoding settings** are altered, the software notifies you on the compression configuration step that a non-DCI-compliant DCP will be generated.



Warning when generating a non-compliant DCP

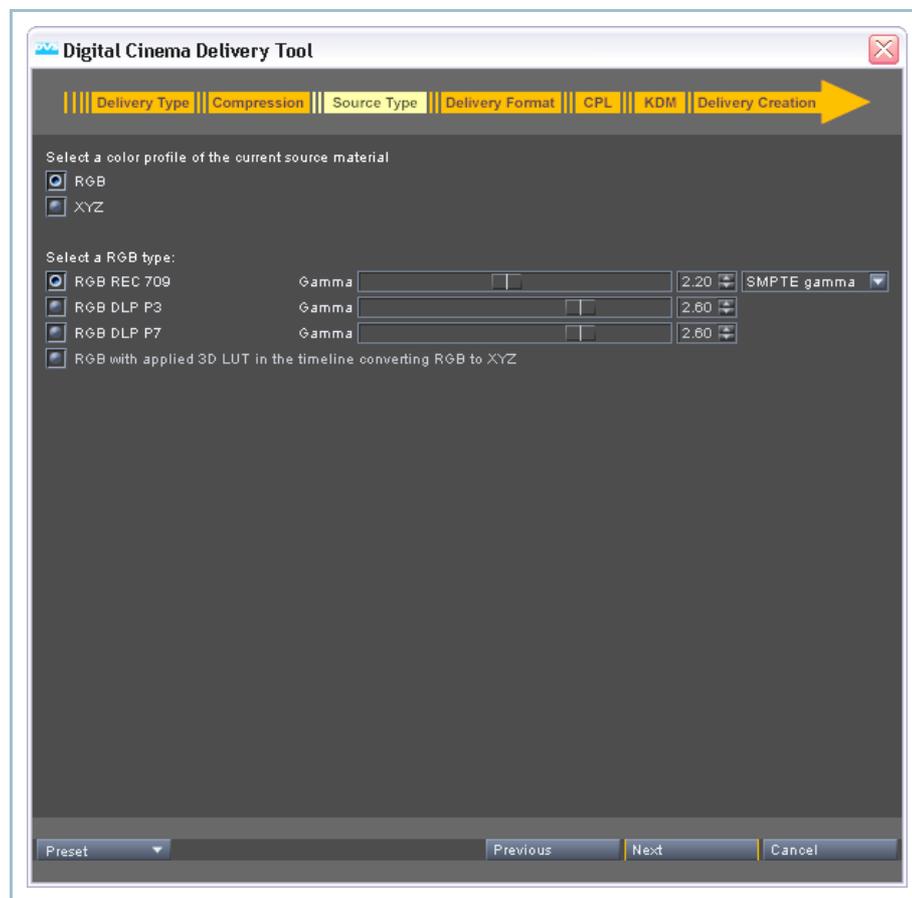
Then you can also use the button **RESET TO DEFAULT** to set back the values to their standard settings



The default values of the advanced JPEG settings can be adapted via the Configuration Tool (menu **Options » Configuration defaults...** » group **JPEG2000 Compression**)

### Stage 3: Source Type

With the source type configuration step you determine the color space and color profile (type) of your source material in the timeline.



This step is not required if an MPEG compression has been selected (see "Stage 2: Compression" on page 270).



Via the radio buttons at the top of the settings area you have to select the color space of your source material in the timeline.

<b>RGB</b>	If the timeline contains clips in the RGB color space, you have to activate this radio button.
<b>XYZ</b>	Select this setting if the clips in the timeline are all in the X'Y'Z' color space.

Depending on the selected color space the options (radio buttons) in the middle of the settings area will be displayed. With them you have to specify how to interpret the color space of the source material in the timeline, i.e. the color profile/type of the selected color space.

<b>RGB REC 709</b>	Activate this radio button if your material is stored in the REC 709 color profile. You can adjust the gamma (luminance) of the output with the items to the right: When switching the combo box to the right from SMPTE gamma (the default gamma as specified by SMPTE which cannot be adjusted) to another setting, the slider will be made available. Then the gamma value can be changed via the slider or the entry field to the right.
<b>RGB DLP P3</b>	Activate this radio button if your material is stored in the DLP P3 color profile. With the slider and the entry field to the right you can adjust the gamma (luminance) of the output.
<b>RGB DLP P7</b>	Activate this radio button if your material is stored in the DLP P7 color profile. With the slider and the entry field to the right you can adjust the gamma (luminance) of the output.
<b>RGB with applied 3D LUT...</b>	This setting will be available when a user-defined 3D LUT has been applied to the timeline. When activated, this 3D LUT will be used for the color conversion.



**Settings for color space 'XYZ'**

**XYZ native**

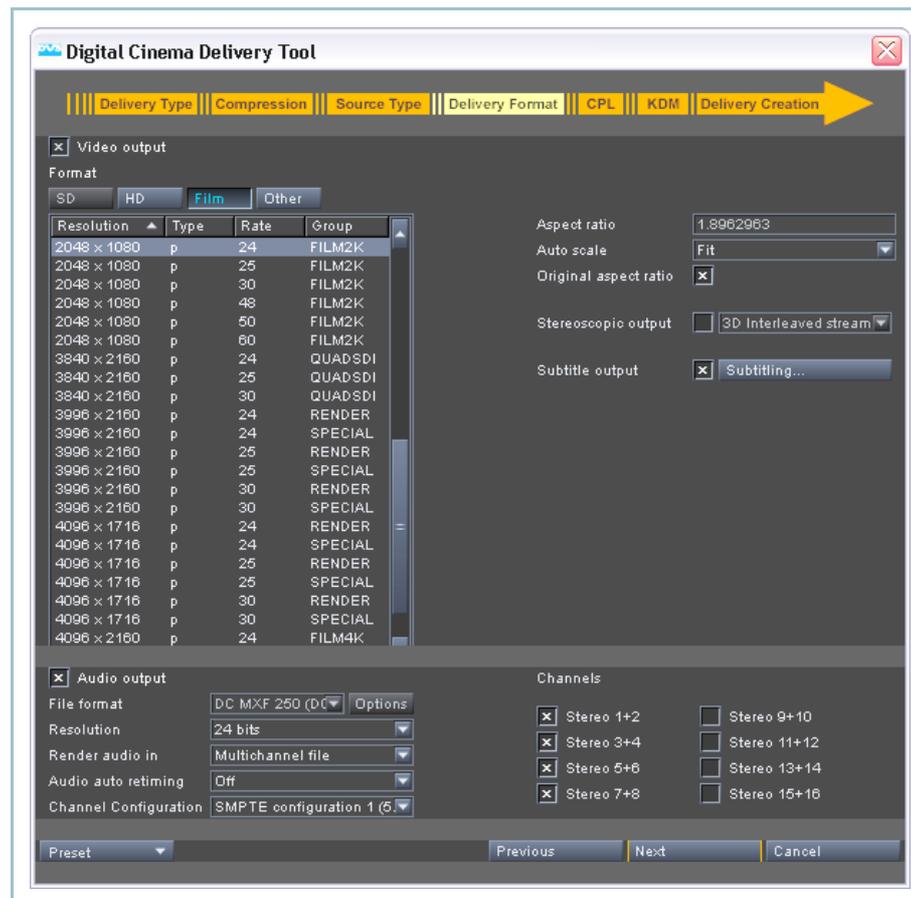
Activate this radio button if your material is stored in the X'Y'Z' color space already. Then no color conversion will be performed.

**YCxCz**

If you material was processed with a YUV matrix, this setting has to be activated. The bin clip properties of these clips in the timeline have to be set to YUV with the appropriate YUV matrix selected that was used to process the material (see also "Preparing a DCDM" on page 371).

**Stage 4: Delivery Format**

The delivery format configuration step is used to determine the output format of the digital cinema content.



The delivery format setting

Depending on the type of material that is available in the timeline (video and/or audio) the respective output types will already be activated.

In the settings pane use the buttons, the list box and the settings items for the video output to specify the video format. Adjust them so that they match your desired output format (normally the one of the final DCP, see section “Possible Formats for DCI Mastering” on page 363).

Additionally, specify the audio format for the digital cinema content according to your needs, for example, select the WAV (DCDM or JPEG2000) or MXF (DCP) file format in 24 bits as a multi-channel file. Audio retiming should be activated when the output frame rate differs from the one selected for the timeline. Additionally, if available, select the respective audio channel configuration (e.g. SMPTE or D-BOX) matching your audio setup in the timeline. With the check boxes to the right you have to determine which audio channels to output/finalize.



For details about the stereoscopic output item refer to "Stereoscopic DCP" on page 426.

In case the digital cinema content should provide subtitles, the check box **Subtitle output** must be activated. With the button **SUBTITLING...** to the right you can specify the output of the subtitles further. It opens the following window:



Subtitle options



In the window **SUBTITLING OPTIONS** you can determine whether or not to create subtitle files with the check box at the top. If activated, you can select the subtitle tracks that a file should be created for (see also "Adding Further Subtitles via Subtitle Tracks" on page 377) with the additional check boxes in the list box. The file format of the subtitle files to be created should be set with regard to the standard of the final DCP (see also "DCP Standards" on page 365).

SMPTE Phase 0/SMPTE Phase 1	XML (* . <i>xml</i> )
SMPTE Phase 2	MXF (* . <i>mx</i> f)

If one of the subtitles should be rendered into the images, you can activate this with the check box **Render subtitle track into the image**. Then you can select the subtitle track that should be rendered into the images with the combo box at the bottom.



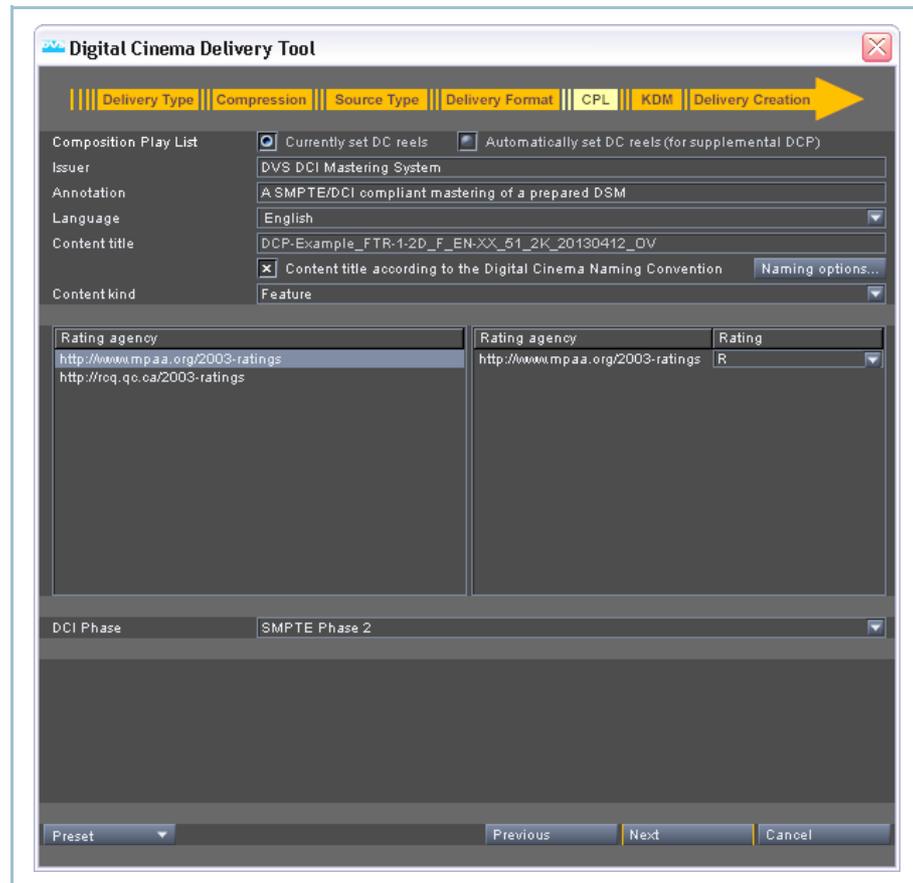
When activating this option, deselect the respective subtitle track in the upper list box, i.e. deselect it from a separate file creation (if separate file creation has been activated as well).

Once the subtitles are set up correctly confirm this with the button **OK**.

After this the configurations for the delivery format are complete and you can go to the next configuration step with the button **NEXT**.

### Stage 5: CPL

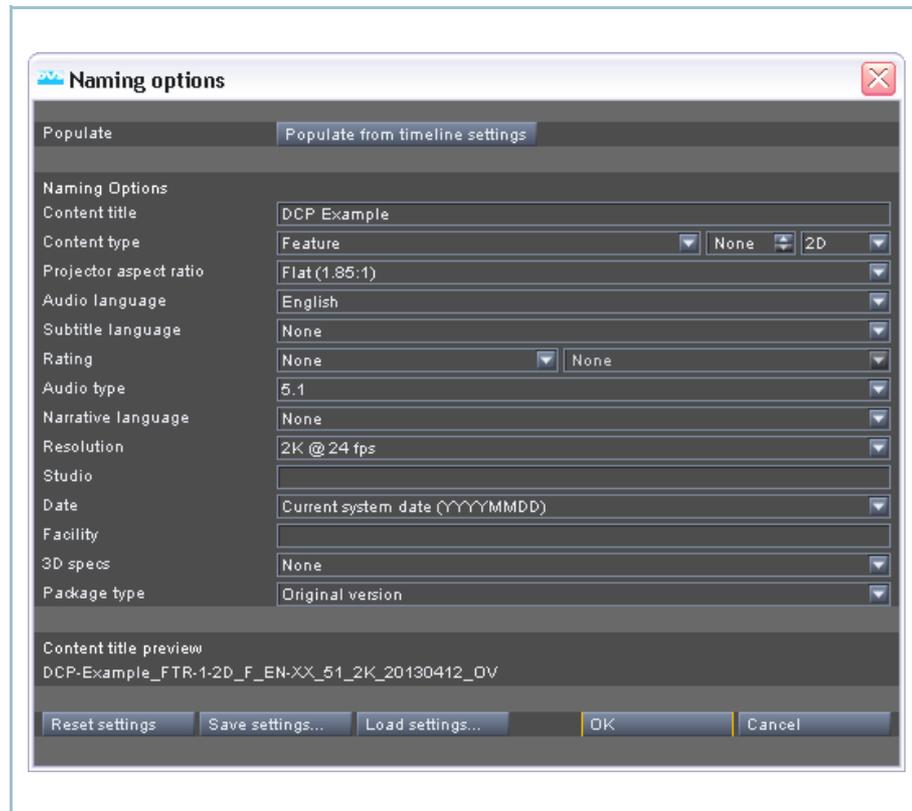
When creating a DCP, you also have to perform the configuration step for a Composition Playlist (CPL).



### CPL settings

With the entry fields in the upper part of the window you can provide details about the DCP to be created (e.g. language or kind of content). They will be written to the CPL file. As a minimum setting the **Content Title** is required.

By activating the check box **Content title according to the Digital Cinema Naming Convention** you can provide a title for your DCP in an abbreviated form. Its goal is to keep the overall title short but still to contain as much information as possible, and to display these in a specific order. You can determine the information that will be used for the title via the button **NAMING OPTIONS....** It opens the following window:



Options for the Digital Cinema Naming Convention

With these combo boxes and presets you can easily generate a name for your DCP. For further information about the D-Cinema naming conventions refer to <http://www.digitalcinemanamingconvention.com>.



Your settings can be saved and loaded again as a preset. There are also some presets already available in the installation path of the CLIPSTER software (default: `C:\Program Files (x86)\DVS\Clipster\presets\dcinct`).

To include a rating for the DCP to be created, you have to use the two list fields. Select the applicable rating agency in the list field to the left with the mouse. Then drag and drop it to the list field to the right. Afterwards adjust the rating with the provided combo box. An already set rating and rating agency can be removed from the list field at the right by selecting it and pressing the **[Del]** key on your keyboard.

With the DCI Phase combo box you select the respective SMPTE standard that the DCP should be created in.

After this the configurations for the CPL are complete and you can go to the next configuration step with the button **Next**.

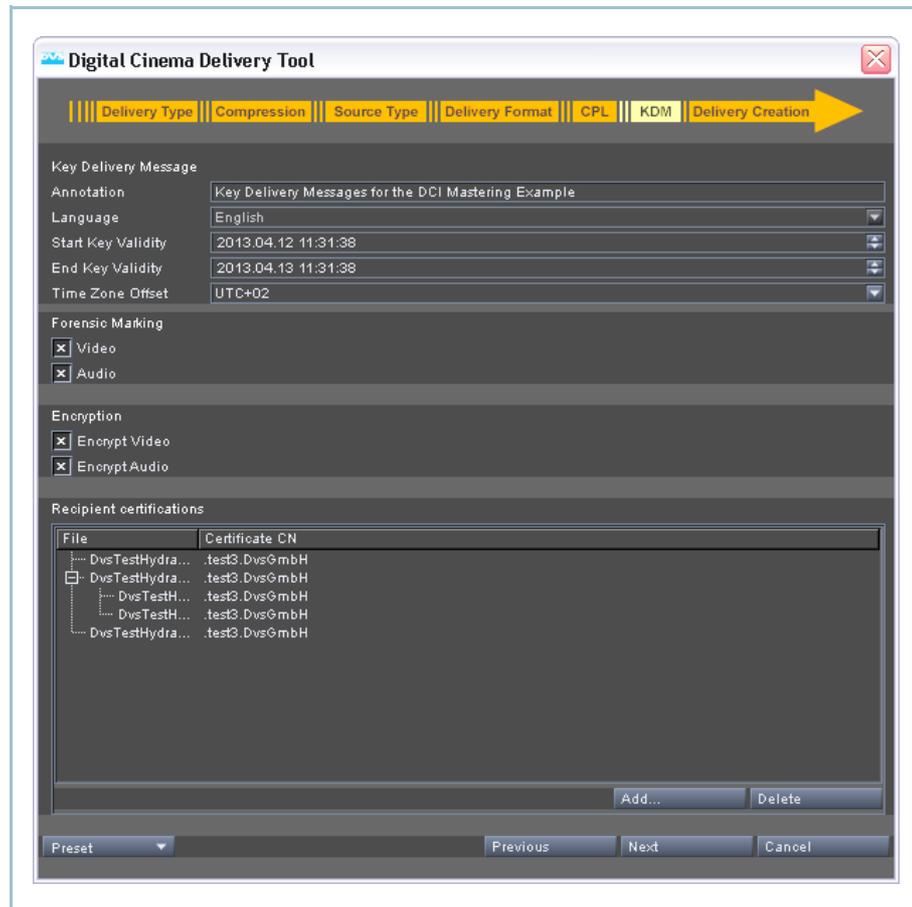
## Stage 6: KDM

If you create an encrypted DCP, one or more Key Delivery Messages (KDMs) have to be created as well. They will contain the encrypted AES key to decrypt the content of the DCP. Usually you will create one KDM for each D-Cinema player/server that should play out the content and for this the respective public key of the D-Cinema player is required. The generation of the KDMs as well as the keys that should be used can be configured with the KDM configuration step.



Further information about the keys and certificates used during the creation and usage of a DCP can be found in "Keys and Certificates Explained" on page 417.

When creating an encrypted DCP, a self KDM is automatically created as well, see also "Using the DCP and Self KDM" on page 400.



KDM settings

With the entry and date/time fields in the upper part of the window you have to provide further details about the KDM(s) to be created as well as their validity. For the generation of a KDM a correct time setting is essential. Date/time entries are standardized and must be given in the format `YYYY.MM.DD hh:mm:ss`.

In the area **Forensic Marking** you can select whether the D-Cinema players should apply a watermarking to the played out video and/or audio data. It is a flag that will be set in the KDM and interpreted by the players.

Via the **Encryption** settings an encryption of the content can be turned on or off. With the respective check boxes you can select the material that should be encrypted.

In the area **Recipient certifications** you can determine the D-Cinema players/servers that should be able to play out the DCP. They have to be selected via their public keys (recipient certificates, Encryption Key). Use the button **ADD...** to select one or more keys (`*.cer` or `*.pem`) via a standard dialog window. Alternatively, you can use a file manager of Windows and drag and

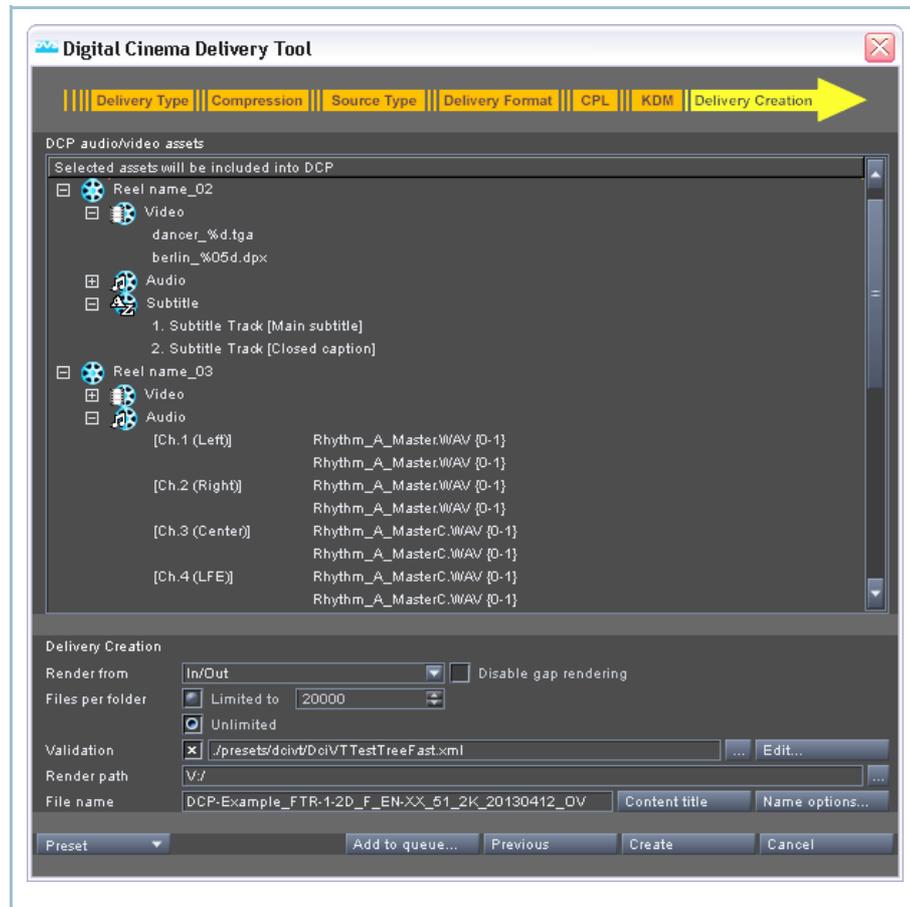


drop the keys directly to the list box of this area. Afterwards they will be detailed in the list box and for each selected key file one KDM file will be created. Already set players (certificates) can be removed by selecting them from the list box and pressing the button **DELETE**.

Additionally, you can add trusted devices such as projectors to a D-Cinema player/server. They can be combined with a player's certificate either by adding a user-prepared certification file to the **Recipient certifications** or by dragging and dropping the projector certificates from a file manager to the respective player certificate in the list box. In the list box the added trusted devices will then appear sorted under the respective player's certificate. In the KDM file for the player they will be listed with their thumb-prints in the `AuthorizedDeviceInfo` section

## Stage 7: Delivery Creation

The delivery creation configuration step is the last step to be performed before the digital cinema content is created. With it you can check the material of a DCP as well as specify further output settings such as the path where the content should be stored.



Delivery creation settings

The area **DCP audio/video assets** will provide information when you create a DCP and at least one DC reel is specified in the timeline. Then it will show you the DC reels as defined in the timeline and their assets. By clicking on a plus/minus (+/-) sign in front of an entry the assets of the reel can be expanded or collapsed, thereby providing you with further details about them. With this you can easily check and confirm the material of each reel of the DCP.

With the settings in the area **Delivery Creation** you can specify the output of the digital cinema content further and determine, for example, its storage location and name. To set the file name(s), you can either enter a name of your own or use the content title as specified during the configuration step for the CPL (button **CONTENT TITLE**). Furthermore, you can apply a variable naming with the button **NAME OPTIONS...**



With the **Validation** settings you can determine that a validation of the created DCP should be performed after its creation. The checks that will be performed can be set by loading/entering a validation preset and/or editing the validation settings with the **EDIT...** button to the right.

A click on the button **Create** will close the digital cinema delivery tool and start the finalizing process to generate the digital cinema content according to your settings at the specified location.

## IMF Delivery Tool

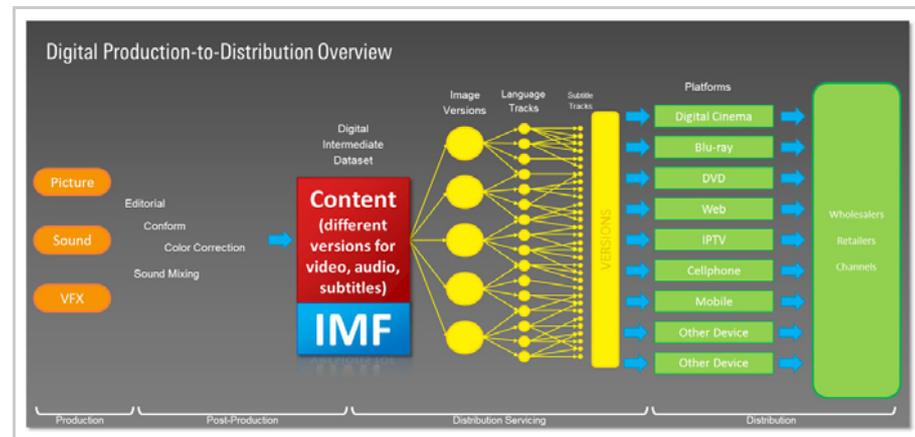
This section describes the Interoperable Mastering Format feature integrated in CLIPSTER. CLIPSTER supports the IMF specification as defined by the SMPTE organization, allowing also a freely configurable package creation.

The following topics are covered:

- Understanding IMF (page 286)
- IMF within the CLIPSTER Context (page 289)
- Working with the IMF Delivery Tool (page 291)

### Understanding IMF

The Interoperable Master Format is a framework for file-based assets providing a complete interchange solution for distribution of motion picture content, including video, audio and timed text. It is intended as a standardized file format to support flexible versioning, thus solving the multi-version ecosystem problem.



IMF is a high-quality file-based final master. It handles all versions within one large IMP – the Interoperable Master Package. This master package wraps all the data in a container: video images, audio data, subtitles/captions, technical metadata and playlists for the content. Heart of the IMF package is the CPL (Composition Play List) which controls the structure of the IMP and combines the different tracks.



The SMPTE organization defines two Application Layers for IMF with their parameters and parameter combinations strictly defined: **Application #2** and **Application #2 Extended**. This means that some image characteristics cannot be used alongside others.

### Application #2:

It is meant for studio applications where a TV or movie title is transformed into multiple content versions that are made available to multiple consumer distribution channels across multiple countries and over the span of many months to over a year. It uses HD image essence coded as a JPEG 2000 codestream and audio essence coded as linear PCM.

Image frames in Application #2 must conform to the following combinations of characteristics:

#### Application #2 image characteristics

<b>Frame width</b>	1 - 1920	
<b>Frame height</b>	1 - 1080	
<b>Bit depth</b>	8, 10	
<b>Frame structure</b>	p	i
<b>Stereoscopy</b>	stereoscopic monoscopic	monoscopic
<b>Frame rate</b>	24 23.98 25 30 29.97 50 60 59.94	25 30 29.97



**Application #2 image characteristics**

<b>Sampling</b>	4:4:4		4:2:2	4:2:2
<b>Quantization</b>	head	full	head	head
<b>Color components</b>	RGB Y <sub>C</sub> B <sub>B</sub> C <sub>R</sub>	RGB	Y <sub>C</sub> B <sub>B</sub> C <sub>R</sub>	Y <sub>C</sub> B <sub>B</sub> C <sub>R</sub>
<b>Matrix (colorimetry)</b>	COLOR .1 COLOR .2 COLOR .3	COLOR .3	COLOR.1 COLOR.2 COLOR.3	COLOR.1 COLOR.2 COLOR.3

**Application #2 Extended:**

This specifications extends the first one with support for image frames with further colorimetry specifications and a maximum width and height of 3840 x 2160 pixels (UHD).

Image frames in Application #2 Extended must conform to the following combinations of characteristics:

**Application #2 image characteristics**

<b>Frame width</b>	1 - 3840		
<b>Frame height</b>	1 - 2160		
<b>Matrix (colorimetry)</b>	COLOR.3	COLOR.4	COLOR.5
<b>Bit depth</b>	8, 10	10	
<b>Frame structure</b>	p		
<b>Stereoscopy</b>	stereoscopic monoscopic		
<b>Frame rate</b>	24 23.98 25 30 29.97		
<b>Sampling</b>	4:2:2		
<b>Quantization</b>	head		
<b>Color components</b>	Y <sub>C</sub> B <sub>B</sub> C <sub>R</sub>		



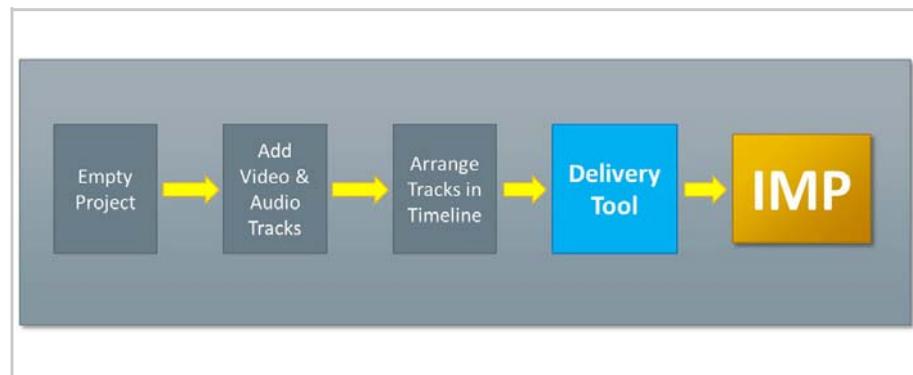
For further information on the combinations restrictions see also "Creating an IMF Package" on page 293, step 4.

## IMF within the CLIPSTER Context

With CLIPSTER, the user is able to convert any video file into a valid IMP package.

All material needed in the IMF package is arranged in the timeline with the sequence markers set directly within the timeline. The system also supports CPL generation and CPL import, batch list processing to create multiple IMPs automatically, and file wrapping based on R&S DVS wrapping algorithms for fastest possible integration of standard additions and changes.

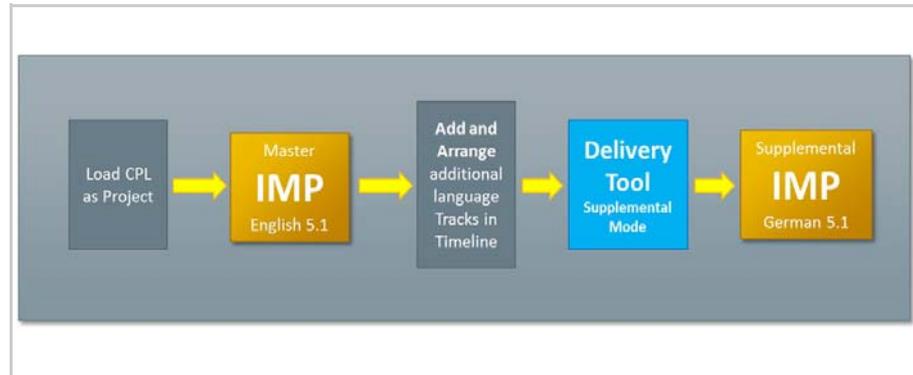
The final IMP generation is done with the IMF Delivery Tool to create an IMF master and verify that all settings are done correctly and according to the IMF specification.



IMF generation workflow

### Supplemental IMPs

Another feature of CLIPSTER is the support of supplemental IMPs which allow to add more versions from an original master by storing additional data such as new audio tracks or video inserts. Then, only a sub-version with the specific (new) assets is created. The system automatically recognizes existing data in the master package as well as additional data to be stored.

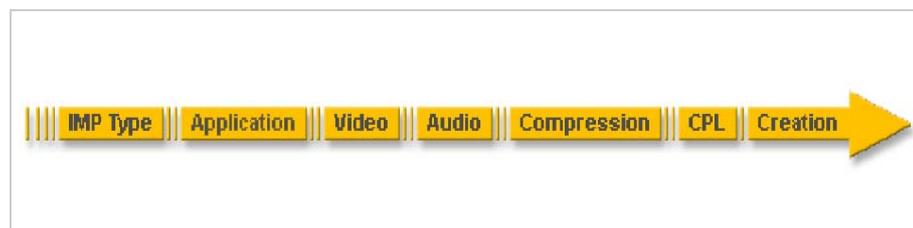


Supplemental IMF generation workflow

**Hard Links** A hard link is a directory entry, pointing to a specific file on the system. Several hard links can refer to one and the same section of data. CLIPSTER uses this technique to create hard links pointing only to original data without having to copy the files, thus saving disk space and conversion time while generating the IMPs.

**Soundfield Combination** CLIPSTER also allows one CPL to relate to several soundfields, e.g. a 5.1 audio track in several languages. Within the IMF Delivery Tool, the audio settings step lets you create multi-soundfield configurations which result in one CPL pointing to all created soundfields, see also "Creating an IMF Package" on page 293, step 5.

**IMF Work-flow** The IMF Delivery Tool is started via **Project > IMF Delivery Tool** or keyboard shortcut **<Ctrl+Shift+D>**. The process until completion comprises seven stages:



IMF creation stages



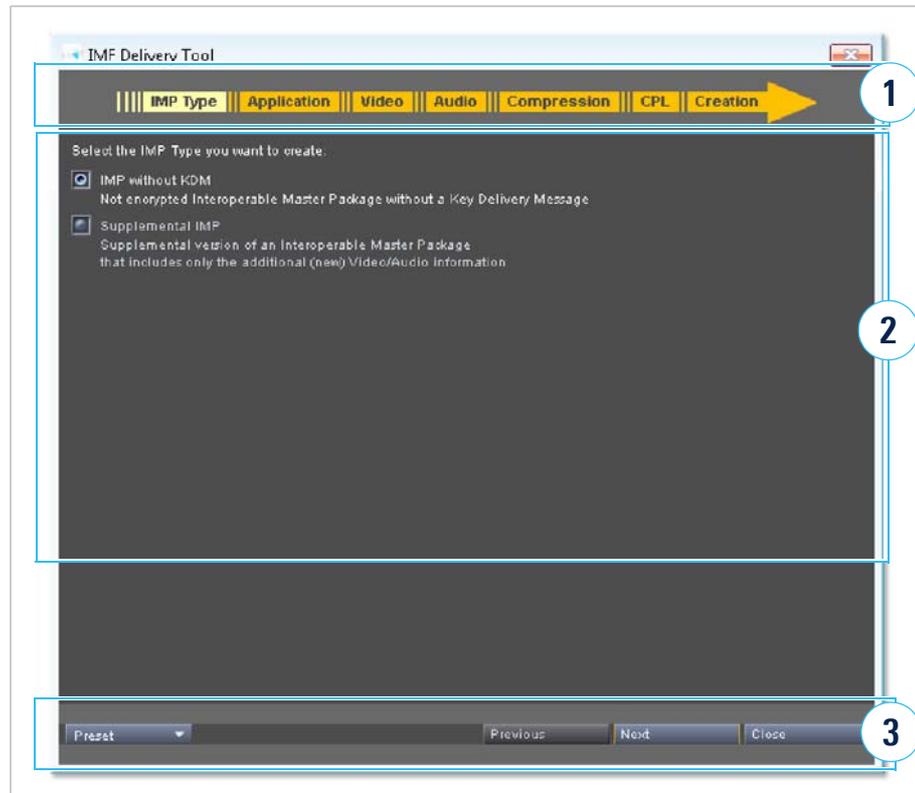
Stage	Description
IMP Type	Selection of the IMP type the deliverable should conform to: <ul style="list-style-type: none"><li>■ IMP without KDM: not encrypted Interoperable Master Package (no Key Delivery Message).</li><li>■ Supplemental IMP: supplemental version of an Interoperable Master Package, that includes only the additional (new) video/audio information.</li></ul>
Application	Selection of the required application layer. Currently, application layer #2 (JPEG2000) is supported: <ul style="list-style-type: none"><li>■ Application #2: JPEG2000 up to full HD according to SMPTE standards.</li><li>■ Application #2 extended: JPEG2000 above full HD up to UHD according to SMPTE standards.</li><li>■ Application #2 experimental: JPEG2000 with freely configurable parameters (no SMPTE constraints).</li></ul>
Video	List of allowed raster indexes for the current application.
Audio	Soundfiled and input/output channel configuration
Compression	Broadcast profile selection
CPL	Metadata selection and information on how the files for a specific package should be played back, including tree view for locale data.
Creation	Render path and file name indication

## Working with the IMF Delivery Tool

This section describes the generation of an IMF compliant delivery package, step by step.

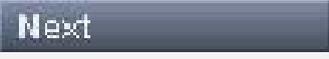
### User Interface Overview

After starting the Delivery Tool, the user interface is displayed on the screen, showing the first configuration stage:



IMF Delivery Tool first stage

No	Item	Description
1	Configuration stages	Shows the progress of the generation settings; yellow indicates the currently active stage, orange indicates the stages that have to be performed for the selected delivery type.
2	Settings pane	Contains the configurations that can be made for the currently displayed configuration step.

No	Item	Description
3	Button area	Buttons to control the delivery tool.
		Via presets you can save and restore the settings of the delivery tool for recurring jobs. Via the options on the <b>Preset</b> drop-down list you can create and administer the presets, e.g. load or save them. Recently used/loaded presets will be listed as well. You can also store the current setup of the delivery tool as a default. These settings will then be available for each new project.
		Opens the previous configuration step for the currently selected delivery type
		Opens the next configuration step for the currently selected delivery type.
		Adds the currently configured delivery type to a batch list for later processing. This button is available only in the last stage „Creation“
		Closes the delivery tool without creating any content. However, already specified configurations will not be lost but stored during run-time.

### Creating an IMF Package

Requirements:  The content to be converted is already edited in the timeline.

Perform the following steps:

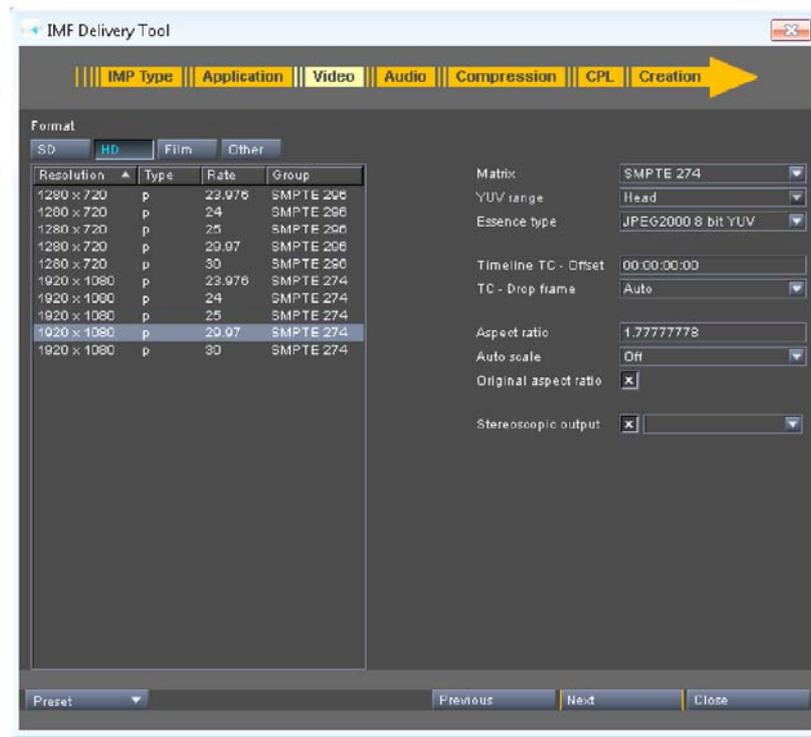
1. Start the IMF Delivery Tool with **Project > IMF Delivery Tool** or keyboard shortcut **Ctrl+Alt+D**.
2. In the first stage **IMP TYPE**, determine whether to create a master IMP or a supplemental one:



3. In the second stage **APPLICATION**, select the application layer you want to use, see "Understanding IMF" on page 286 for more details on the application layers.



4. In the third stage **VIDEO**, select the required video settings.



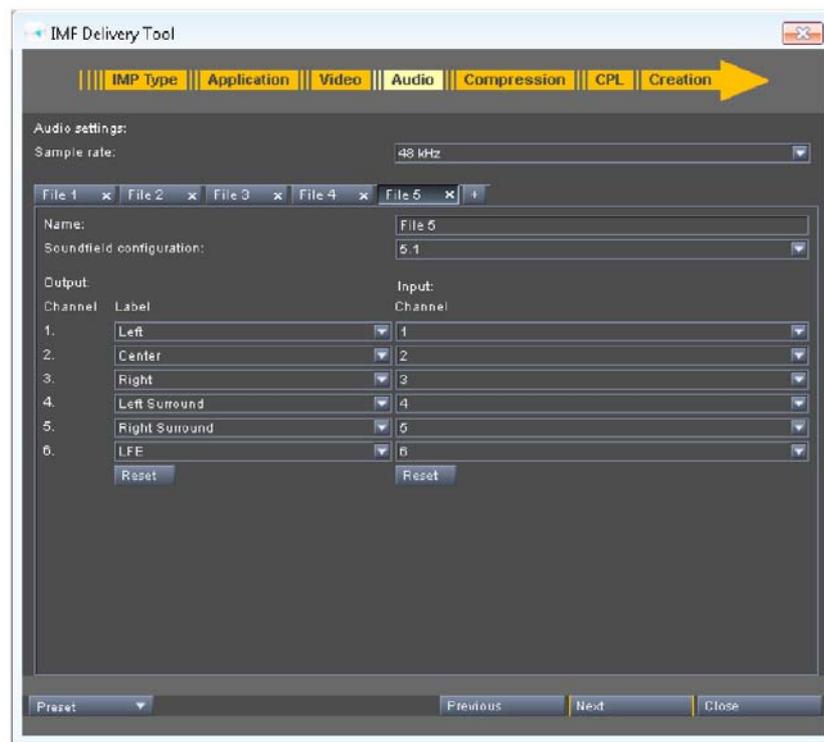
**Video data**

Item	Description
Format	Selection of the required output format
Matrix	Selection of the required colorimetry. In CLIPSTER, the SMPTE colorimetry specifications are mapped as CCIR 601 and SMPTE 274.
YUV range	Selection between full YUV range and head only, see "Encoding Ranges" on page 238.
RGB range	Selection between full RGB range and head only, see "Encoding Ranges" on page 238
Essence type	The essence type is a predefined combination of the specification parameters <b>BIT DEPTH</b> , <b>SAMPLING</b> and <b>COLOR COMPONENTS</b> , see also table in section "Understanding IMF" on page 286
Timeline TC Offset	Enter a possible timecode offset from the timeline.
Aspect ratio	Selection of the desired aspect ratio
Auto scale	Enable/disable auto-scaling or crop or fit image frame.

### Video data

Item	Description
Original aspect ratio	Mark this check box if you want to keep the original aspect ratio.
Stereoscopic Output	Mark the check box to create a dual stream IMF. In this case the software creates two files (left eye/right eye) in the folder.

- In the fourth stage **AUDIO**, select the audio settings of the delivery. If additional audio configurations are required, add a new settings file by clicking the **+** button.



### Audio settings

Item	Description
Sample rate	Selection of the sampling frequency
File	A tab bar with specific audio configuration(s). In case there are several soundfield configurations in your project, add a new configuration tab for each soundfield in the timeline.
Name	Assign a name to the currently selected audio configuration.

**Audio settings**

Item	Description
Soundfield configuration	Soundfield type selection
Output channel	The audio channels to be played out
Input channel	The audio channels from the timeline to be mapped to the correct output channels.

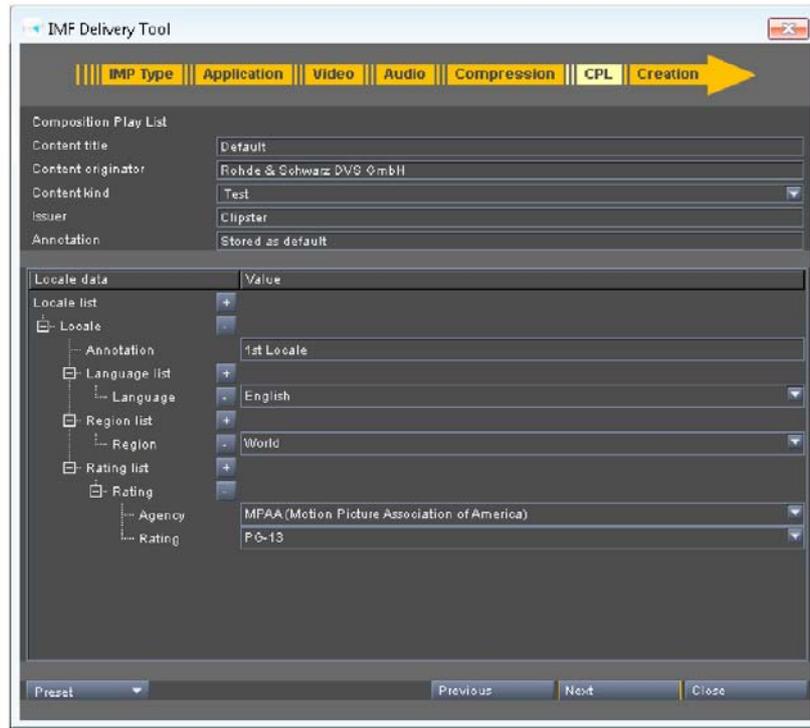
6. In the fifth stage **COMPRESSION**, select the broadcast profile the content should be compressed with.



**Compression**

Item	Description
JPEG2000 parameter preset	The compression level can be selected here.
JPEG2000 rate control	Each level has predefined rates (Mb/s), however, the user can set its own. 0 means lossless.

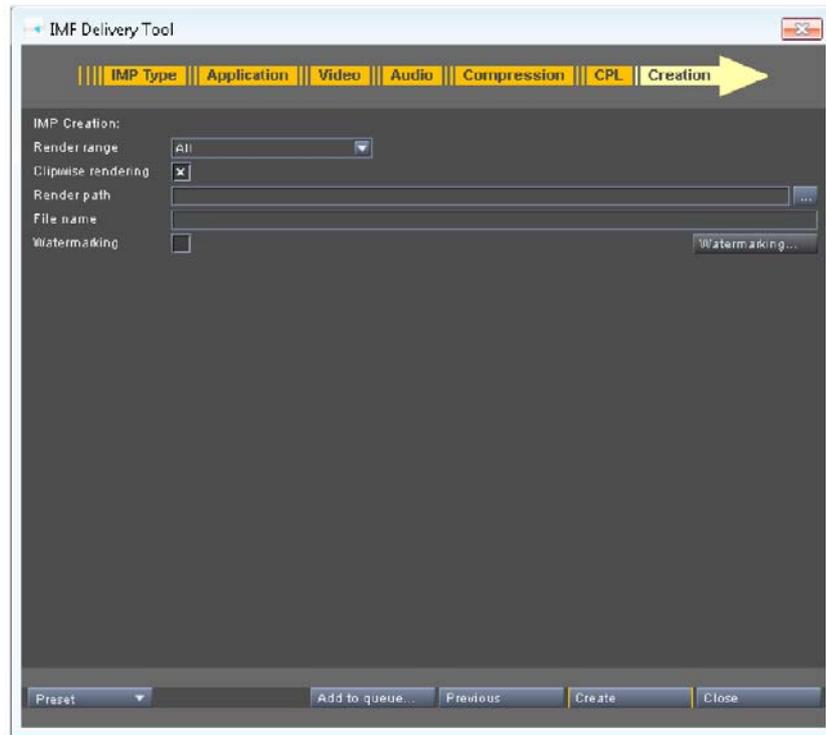
7. In the sixth stage **CPL**, specify the playlist metadata.



#### CPL

Item	Description
Content title	Name of the deliverable
Content originator	Company/creator name
Content kind	Type of content created
Issuer	The rendering system the content has been created on
Annotation	Comments by the user
Locale list	Contains the following entries: <ul style="list-style-type: none"> <li>■ Locale annotation</li> <li>■ Language list</li> <li>■ Region list</li> <li>■ Rating list</li> </ul>

8. In the last stage, start the transcoding process.



#### Creation

Item	Description
Render range	Select whether to process the entire content or only the content between the inpoints and outpoints.
Clipwise rendering	If enabled, several <b>.mxf</b> files are created in the output folder. Their number matches the number of the sequences placed in the timeline.
Render path	Output directory for the IMP
File name	Assign name to the file.
Water-marking	Opens the watermarking tool, see "Forensic Watermarking" on page 347.

The IMF package has been created.

#### The Generated Files

The generated files form a package containing the mxf files (video and audio), the CPLs, and several other description files.

The following table lists the generated files and their purpose:



#### Generated files in an IMF package

File	Description
<b>*.mxf</b>	The actual video or audio file. If reels were set in the timeline, you will receive for each reel one .mxf file per output format (video and/or audio).
<b>CPL_*.xml</b>	The Composition Playlist specifies the sequence of the track files and thus the order of the playout. Contains hash values of the track files, certificates and a signature for verification purposes.
<b>ASSETMAP.xml</b>	The Asset Map details the content of the delivered package and the paths to its files relative to the Asset Map.
<b>PKL_*.xml</b>	Packing List containing information and IDs about the files of a package. Contains hash values of most of the IMP files, certificates and a signature for verification purposes
<b>VOLINDEX.xml</b>	The Volume Index is used to map the assets of a package when they are stored across several storage volumes (e.g. if the IMP is larger than a single storage medium). The creation of a multi-volume distribution is currently not supported.



## IMF Package Merge Tool

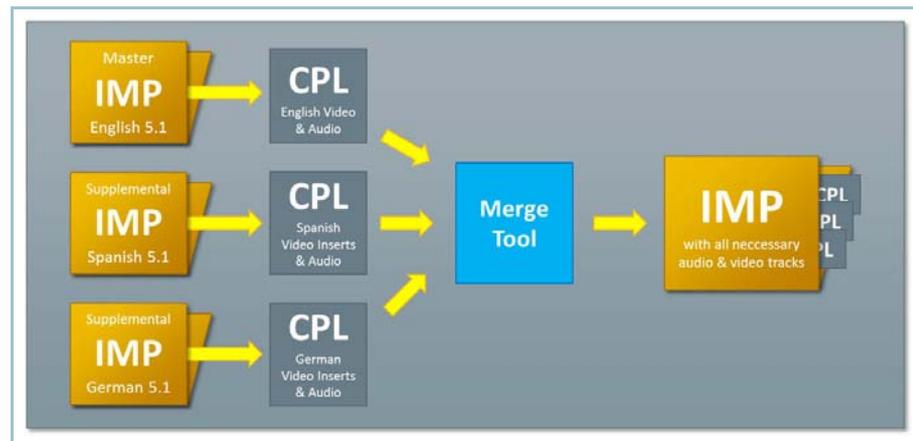
The Package Merge Tool is used to rearrange IMF packages by merging different essences. This section describes this tool in detail.

The following topics are covered:

- Understanding IMP Merging (page 302)
- Hard Linking (page 303)
- Working with the IMF Package Merge Tool (page 305)

### Understanding IMP Merging

Working with multiple audio and video versions of the same material typically creates multiple IMPs – each with its own folder and files. The Merge Tool allows to consolidate those multi-version IMPs into one single IMP.



Merging of several IMPs to one IMP

To merge all the essences into a single package, the Merge Tool requires the Composition Playlists (CPLs) of the corresponding IMPs. The created files form a package containing the .mxf files (video and audio), the CPLs, and several other description files.

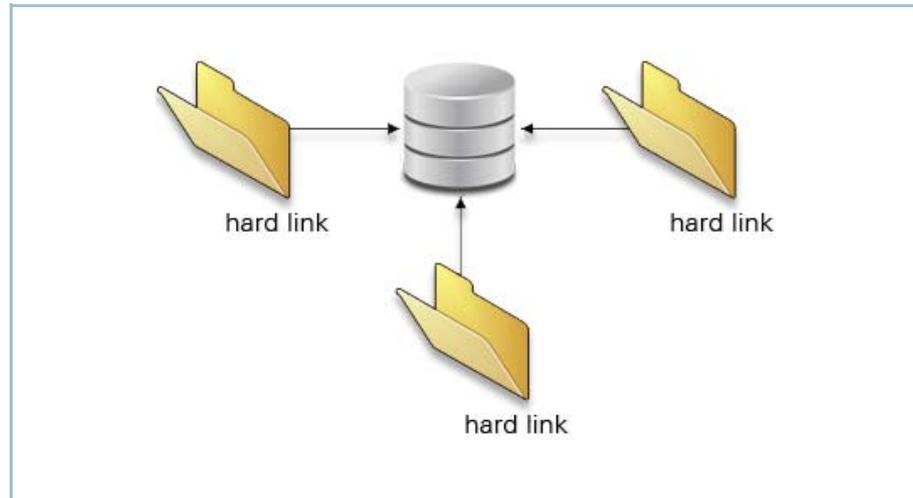
The following table lists the generated files and their purpose:

**Generated files in an IMF package**

File	Description
*.mxf	The actual video or audio file. If reels were set in the timeline, you will receive for each reel one .mxf file per output format (video and/or audio).
CPL_*.xml	The Composition Playlist specifies the sequence of the track files and thus the order of the playout. Contains hash values of the track files, certificates and a signature for verification purposes.
ASSETMAP.xml	The Asset Map details the content of the delivered package and the paths to its files relative to the Asset Map.
PKL_*.xml	Packing List containing information and IDs about the files of a package. Contains hash values of most of the IMP files, certificates and a signature for verification purposes.
VOLINDEX.xml	The Volume Index is used to map the assets of a package when they are stored across several storage volumes (e.g. if the IMP is larger than a single storage medium). The creation of a multi-volume distribution is currently not supported.

## Hard Linking

A hard link is a directory entry, pointing to a specific file on the system. Several hard links can refer to one and the same section of data. CLIPSTER uses this technique to create hard links pointing only to the original data without having to copy the files, thus saving disk space and conversion time while generating or merging the IMPs.



Hard linking

In CLIPSTER you can choose between the following modes when generating a DCP or an IMP, or when merging IMPs:

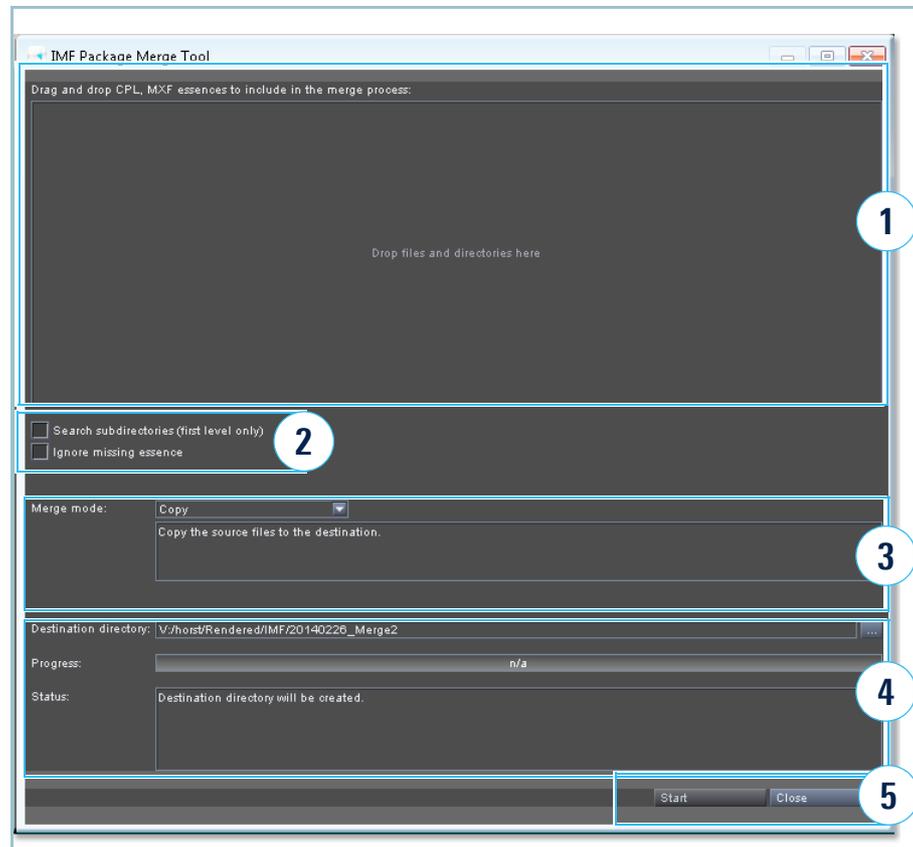
- Copy - generates a new copy of the merged files.
- Hard linking - sets hard links, only pointing to the original data, thus saving disk space and time.
- Hard linking with Copy fallback (default) - the system attempts to generate hard links; if not possible, the system generates a new copy of the files.



Hard links cannot point outside a local filesystem. If unsure whether the target destination is on the same filesystem or not, then select the „fallback to Copy“ default option.

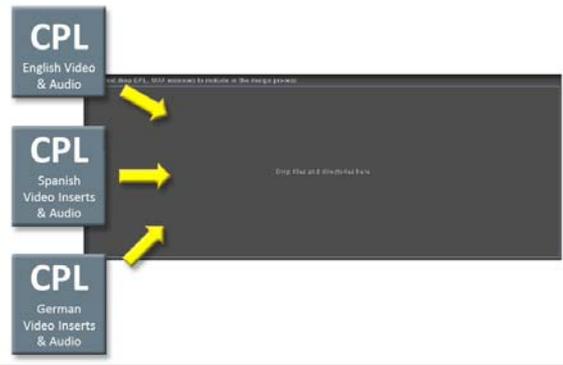
## Working with the IMF Package Merge Tool

The IMF Package Merge Tool is started via **Project > IMF Package Merge Tool** or keyboard shortcut **Ctrl+Alt+M**.



User Interface of the IMF Package Merge Tool



No	Item	Description
1	Drop area	<p>Drag and drop here the CPLs from the master packages you want to merge.</p>  <p>You can also add an entire folder with CPLs and the MXF essences into the drop area.</p>
2	Options pane	<p>Provides the following options:</p> <ul style="list-style-type: none"> <li>■ Search subdirectories - it includes also CPLs in subdirectories (one sub-level only)</li> <li>■ Ignore missing essences - ignore warnings if <b>.mxf</b> files could not be found.</li> </ul> <p><b>NOTE:</b> This will allow the creation of packages with one or several missing <b>.mxf</b> files.</p>
3	Merge modes	<p>Choose between the following modes:</p> <ul style="list-style-type: none"> <li>■ <b>HARD LINKING WITH COPY FALLBACK</b> - the system attempts to generate hard links; if not possible, the system generates a new copy of the files.</li> <li>■ <b>HARD LINKING</b> - sets hard links, only pointing to the original data, thus saving disk space and conversion time</li> <li>■ <b>COPY</b> - generates a new copy of the merged files</li> </ul>
4	Target and status area	<p>Selection of the destination directory as well as progress bar and status messages.</p>
5	Button area	<p>Buttons to control the delivery tool.</p>



No	Item	Description
		Starts the merging process. when the merge is started, the button changes to a <b>Stop</b> button allowing the running merge to be stopped. Any files already copied/hard-linked/created in the destination when the merge is stopped will remain.
		Closes the tool without creating any content.



## AS-11 Delivery Tool

This section describes the AS-11 file format feature integrated in CLIPSTER. CLIPSTER supports the AS-11 specification as defined by the Digital Production Partnership (DPP UK).

The following topics are covered:

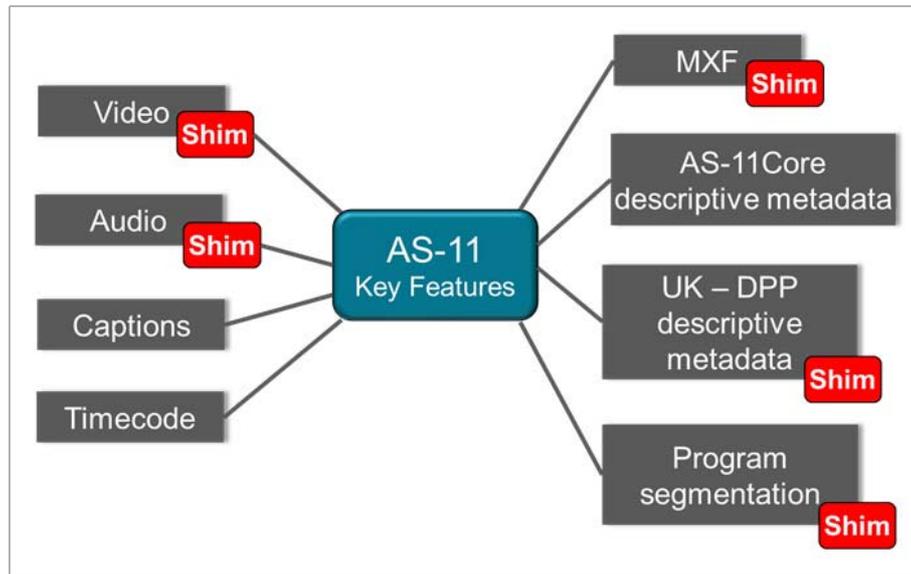
- Understanding AS-11 (page 308)
- AS-11 within the CLIPSTER Context (page 311)
- Working with AS-11 Delivery Tool (page 314)

### Understanding AS-11

AS-11 is a MXF file format intended for the delivery of finished program content from the producers to broadcast networks or program origination facilities. It defines a minimal core metadata set, along with a program segmentation metadata scheme.

The main goal of this specification is to allow content providers to create one version for delivery for various recipients, thus simplifying the exchange process. It is meant to be used throughout the entire content delivery chain: post-production houses, captioning facilities, broadcast networks and transmission service providers.

AS-11 is intended as a file-based replacement for tape-based workflows. It constitutes a container which holds a version of a single program, much like a tape. However, AS-11 contains descriptive metadata that replaces the paper form in the tape box. The specification includes a small number of mandatory data, including a number of optional fields that are specific only to the Digital Production Partnership for distribution in UK. The DPP defined AS-11 as their only contribution format and specified a subset of this file structure - the so-called DPP shim.



AS-11 key features

The following tables indicate the parameters used to create an AS-11 shim (SD and HD), meaning those parameters that are constrained within the specification.

**AS-11 UK DPP SD Shim Specification**

Shim parameter	Shim value
Shim Name	UK DPP SD
Shim Version	1.1
Video Encoding	SD D-10 50 Mbit/s
Video Format	576i50
Audio Encoding	AES3
Audio Channel Arrangement	single multichannel
Audio Track Allocation	EBU R 48:2a (Stereo with silence, 4 tracks) EBU R 123:4b (Stereo with M&E) EBU R 123:4c (Stereo with AD)
Closed Caption Presence	none
Closed Caption Standard	N/A
Timecode Mode	non-drop frame
Default Timecode	N/A



**AS-11 UK DPP SD Shim Specification**

Shim parameter	Shim value
Additional Descriptive Metadata Schemes	DM_AS_11_UKDPP
Index Strategy Frame	lead
Essence Partition Strategy	single
Permitted AFD Set	9, 10, 14

**AS-11 UK DPP HD Shim Specification**

Shim parameter	Shim value
Shim Name	UK DPP HD
Shim Version	1.1
Video Encoding	HD AVC-Intra Class 100
Video Format	1080i50
Audio Encoding	PCM
Audio Channel Arrangement	mono-only
Audio Track Allocation	EBU R 48:2a (Stereo with silence, 4 tracks) EBU R 123:4b (Stereo with M&E) EBU R 123:4c (Stereo with AD) EBU R 123:16c (5.1 with M&E) EBU R 123:16c (5.1 with AD) [To be used in conjunction with AD flag] EBU R 123:16d (two 5.1 languages) EBU R 123:16f (three languages)
Closed Caption Presence	none
Closed Caption Standard	N/A
Timecode Mode	non-drop frame
Default Timecode	N/A
Additional Descriptive Metadata Schemes	DM_AS_11_UKDPP

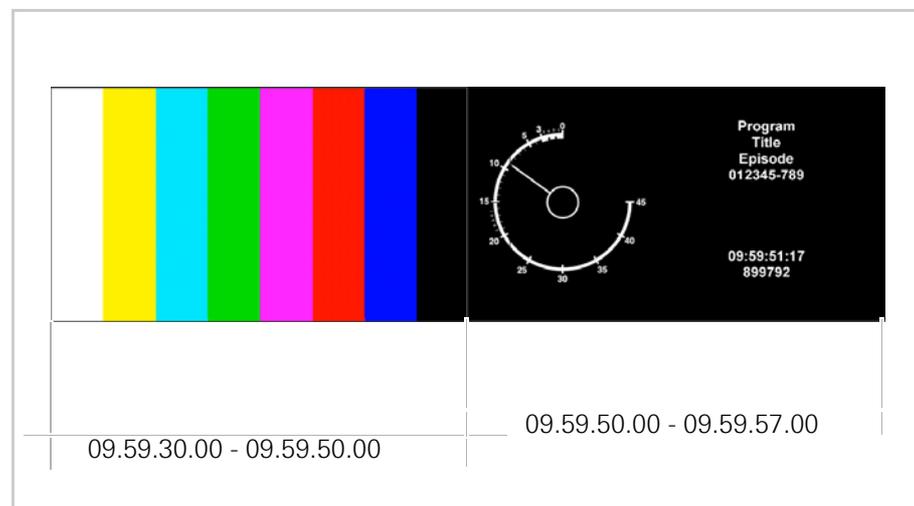
### AS-11 UK DPP HD Shim Specification

Shim parameter	Shim value
Index Strategy Frame	lead
Essence Partition Strategy	single
Permitted AFD Set	9, 10, 14

### AS-11 within the CLIPSTER Context

With CLIPSTER, the user is able to load, playback and transcode AS-11 files. Other file formats can be also converted into a valid AS-11 file. The system supports the complete DPP UK shim with all metadata including hard segmentation markers.

Another goal of the implementation in CLIPSTER is to mimic the tape-based workflow during editing and playout. The specification provides program segmentation schemes to follow certain steps as if working with a tape. For instance, every program starts with a lineup consisting of color bars for 20 seconds and a slate for 10 seconds (identifier clock).



Program lineup

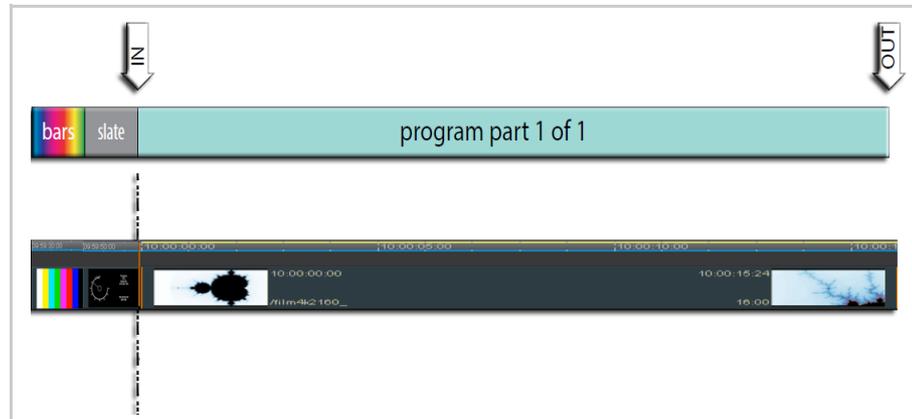


AS-11 compliant lineup (color bars and ident clock) gets inserted at 9:59:30 and 9:59:50. Program start is always set to 10:00:00

## Segmentation

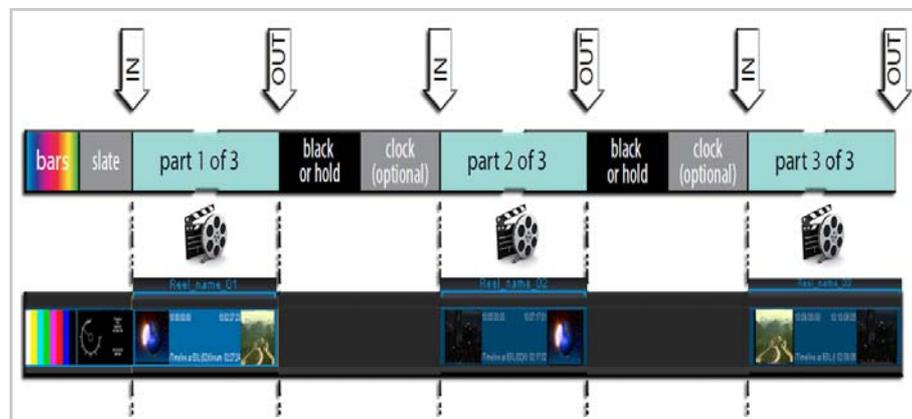
AS-11 metadata can be used to define the segmentation of a program into parts. Thus, program interruptions (e.g. commercial breaks) can be easily handled.

### Single-part segmentation:



A single-part program has a lineup followed by a single program segment. A single part program will always be played from start point to end point without interruption.

### Hard-parted segmentation:



A hard-parted program has a lineup, black blocks and optional identification clock where a broadcaster must insert non-program content between a program.



Use IN and OUT points to define the program parts within reels. The content inside a reel is referred to as program, whereas the content outside as "non-program".



All program parts in the timeline are represented as reels in the bin. If no reels are defined, the AS-11 Delivery Tool assumes the timeline starts with 30 seconds of lineup followed by a single program part (one reel).

### AS-11 workflow

With AS-11, CLIPSTER supports the digital creation and delivery of program content without the necessity of omitting the tape-based workflow. In a typical AS-11 workflow the user will:

- 1 load the program clips of each segment into the timeline and edit them.
- 2 prepare the lineup and, if required, the non-program elements according to DPP standards.
- 3 enter the metadata and technical specifications in the AS-11 Delivery Tool, according to the DPP shim specification.
- 4 finalize the content into an AS-11 compliant file format using the Delivery Tool.



The AS-11 file format has a 25 frame rate. Therefore, the timeline output settings must be set to 1920x1080i25 before finalizing.



Make sure that the timeline is composed as the resulting AS-11 file should look like, meaning it conforms to DPP standards:

- Exactly 30 sec. of lineup
- Program starts at 10:00:00
- Reels are set correctly, distinguishing program from non-program parts.

Metadata entry and finalization are done in the AS-11 Delivery Tool, which is started via **Project > AS-11 Delivery Tool**. The process until completion comprises five stages:



AS-11 creation stages



Stage	Description
AS-11 Shim	Selection of one of the two shims the deliverable should conform to: <ul style="list-style-type: none"> <li>■ Standard Definition Encoding (UK DPP)</li> <li>■ High Definition Encoding (UK DPP)</li> </ul>
Editorial	All descriptive metadata is entered here. Some of the entry fields are mandatory.
Video	Codec and video information (depends on used shim, not editable for UK DPP shims).
Audio	Audio specification such as track layout and language are entered here.
Creation	Additional information regarding the file generation such as save path, render area and an XML „sidecar“.



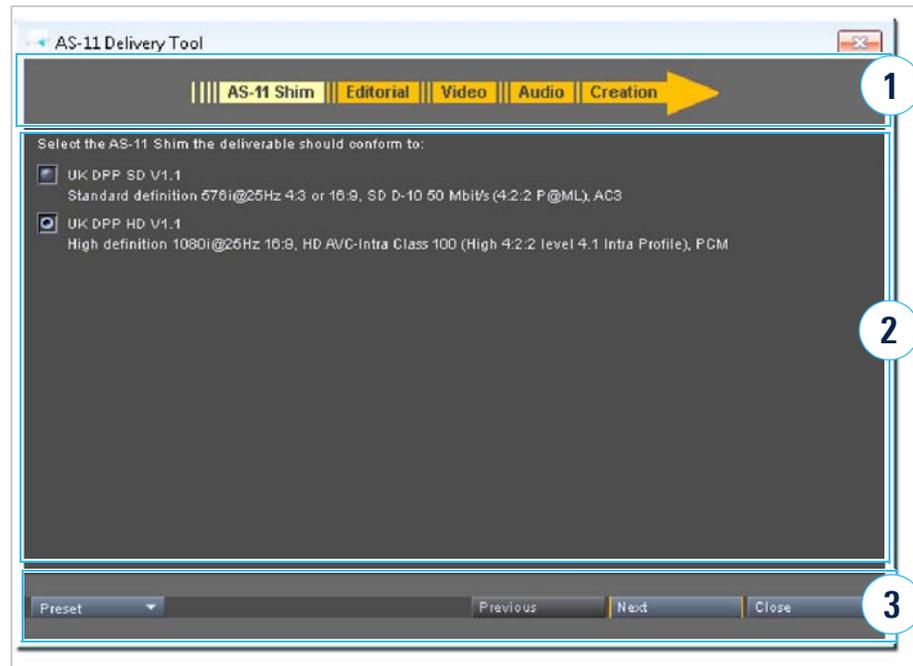
A single file is created after conversion to AS-11. If required, an additional XML file containing the metadata (so-called sidecar) can be also generated.

## Working with AS-11 Delivery Tool

This section describes the generation of an AS-11 compliant file format, step by step.

### User Interface Overview

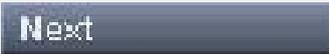
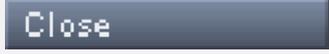
After starting the Delivery Tool, the user interface is displayed on the screen, showing the first configuration stage:



AS-11 Delivery Tool first stage

No	Item	Description
1	Configuration stages	Shows the progress of the generation settings; yellow indicates the currently active stage, orange indicates the stages that have to be performed for the selected delivery type.
2	Settings pane	Contains the configurations that can be made for the currently displayed configuration step.



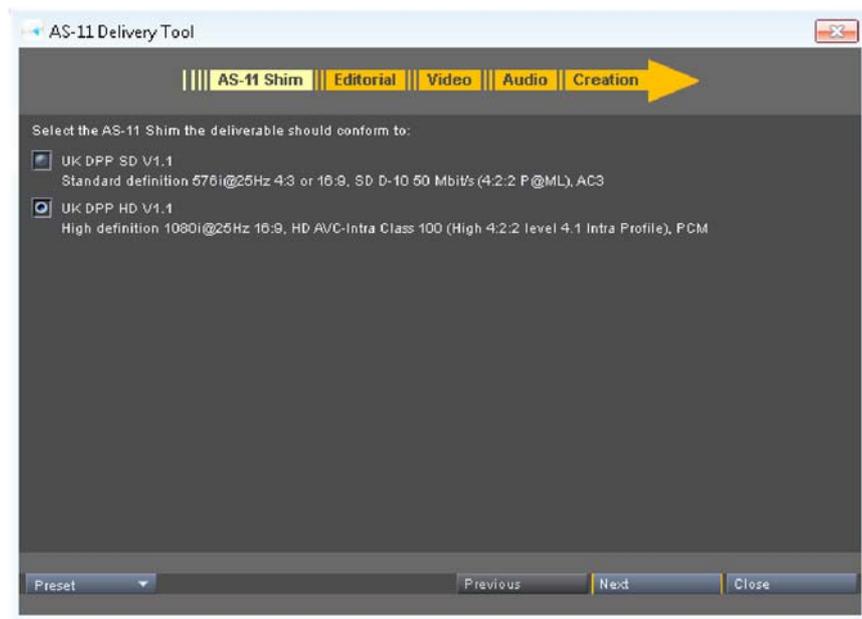
No	Item	Description
3	Button area	Buttons to control the delivery tool.
		Via presets you can save and restore the settings of the delivery tool for often recurring jobs. Via the options on the <b>Preset</b> drop-down list you can create and administer the presets, e.g. load or save them. Recently used/loaded presets will be listed as well. You can also store the current setup of the delivery tool as a default. These settings will then be available for each new project.
		Opens the previous configuration step for the currently selected delivery type
		Opens the next configuration step for the currently selected delivery type.
		Adds the currently configured delivery type to a batch list for later processing. This button is available only in the last stage „Creation“
		Closes the delivery tool without creating any content. However, already specified configurations will not be lost but stored during run-time.

### Creating an AS-11 file

- Requirements:
- The content to be converted is already edited in the timeline.
  - The timeline output settings are set to 1920x1080i25.

Perform the following steps:

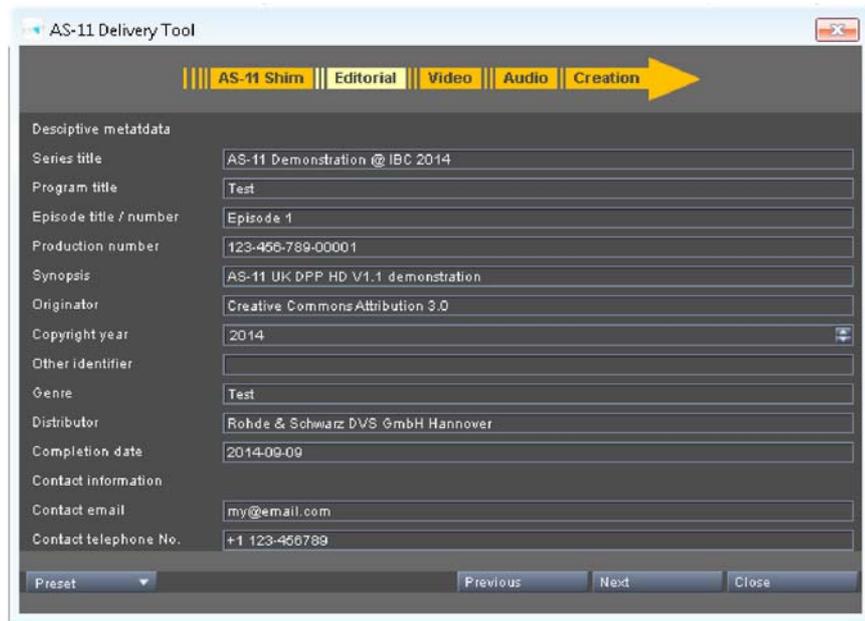
1. Start the AS-11 Delivery Tool with **Project > AS-11 Delivery Tool** or keyboard shortcut **Ctrl+Alt+A**.
2. In the first stage **AS-11 SHIM**, determine the delivery type that should be created:



- ▶ For standard definition select the UK DPP SD (576i@25Hz in 4:3 or 16:9)
- ▶ For high definition select the UK DPP HD (1080i@25Hz in 16:9)



- In the second stage **EDITORIAL**, define the descriptive metadata to be delivered with the video content.



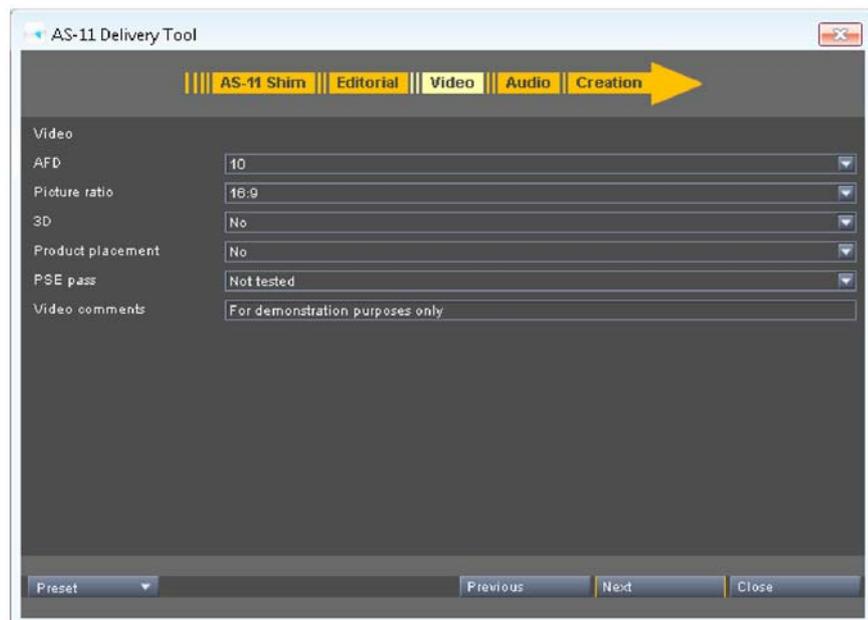
**Metadata entries as defined by DPP**

Item	Description
Series title (mandatory)	The final title of a group of programs with shared identification and branding linked by common characters, subject matter, style or story. This could be a series, serial or themed grouping.
Program title (mandatory)	The title of an individual program version for a specific purpose.
Episode title / number (mandatory)	Final episode name and/or number used to identify an individual episode within a series. Not used for version information.
Production number (mandatory)	A unique number or code used to identify an individual program version. This is typically assigned or defined by the broadcaster to support file management processes.
Synopsis (mandatory)	Descriptive summary of the content of no more than 127 characters potentially suitable for EPG/billings purposes.
Originator (mandatory)	Company responsible for creating the program. It may also be delivered by the originator or by a different distributor.

**Metadata entries as defined by DPP**

Item	Description
Copyright year (mandatory)	Year in which the production was completed.
Other identifier	A unique code other than the production number that can be used to identify a piece of content, potentially assigned by the program provider.
Genre	The genre to which the program belongs. This may relate back to the genre under which the program was commissioned and therefore be defined by the broadcaster.
Distributor	The name of the person or company providing the content if not the production company.
Completion date	Date of completion of the edit prior to delivering the final content.
Contact email	The email address of the SPOC (Single Point of Contact) for the use of the recipient regarding any delivery or technical issues.
Contact telephone No.	The direct telephone number of the SPOC (Single Point of Contact) for the use of the recipient regarding any delivery or technical issues.

4. In the third stage **VIDEO**, select the required video specification using the drop-down lists.

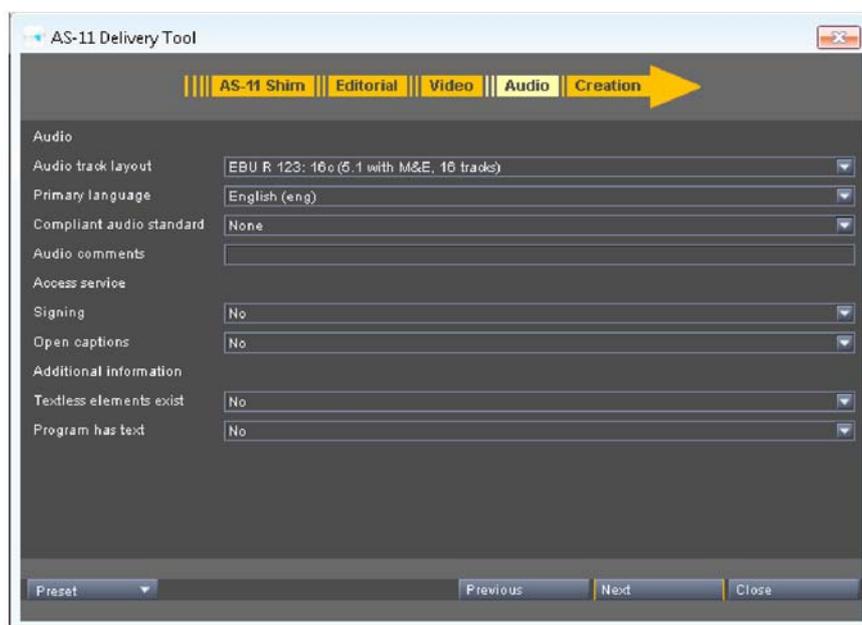




Video data

Item	Description
AFD	Active Format Description code, used to describe the intended display aspect ratio of the material. '9' indicates 4:3, '10' indicates shot and protected for 16:9 only, '14' indicates shot and protected for 14:9 (including title and caption safe area).
Picture ratio	This will be used by the broadcaster in addition to the AFD field to further determine the editorial aspect ratio. A drop-down list of permitted values is given as 4:3, 14:9, 15:9, 16:9, 37:20, 21:9 and 12:5.
3D	Indicates if the material is 3D, and if so, describes the type of 3D being delivered. A drop-down list of permitted values is given as No, Side by Side, Dual, Left Eye Only and Right Eye Only.
Product placement	This is to be set if the editorial content contains any product placement. <b>Note:</b> this has no relation to whether an embedded P logo is present within the post produced material or not.
PSE pass	Status of any flashing and pattern analyzer test carried out on the material for Photo Sensitive Epilepsy. Drop-down options are Yes, No, Not Tested.
Video comments	Comments illustrating the subjective quality and any known artifacts or defects within the video content, whether intentional (e.g. mimicking old content) or a fault detected during quality control or review processes. All significant known issues must be noted here, or delays may be caused in subsequent processes.

5. In the fourth stage **AUDIO**, select the audio settings of the delivery.



#### Audio data

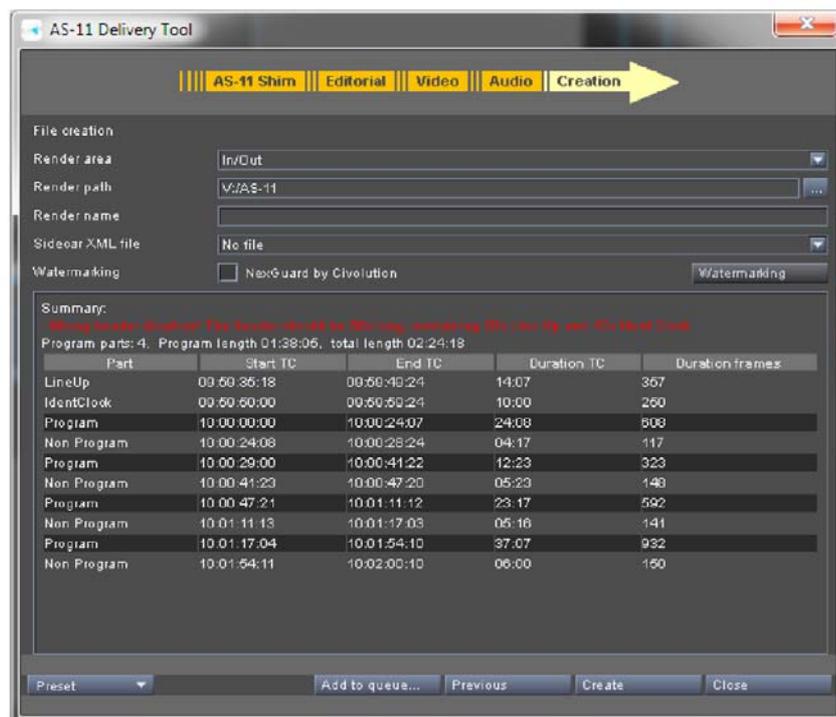
Item	Description
Audio track layout	Code indicating the audio track layout. HD files must have 4 or 16 tracks, SD must have 4. Unused tracks must contain digital silence. <b>NOTE:</b> Including valid silence is required!
Primary language	Primary language used in the main sound track of the program. <b>NOTE:</b> Use ISO 639.2 values, three letter codes e.g. English = eng, French = fre.
Compliant audio standard	Details of any compliant audio standard used to constrain the dynamic range of the audio tracks during production.
Audio comments	Comments illustrating the subjective quality and any known artifacts or defects within the audio content. Whether intentional (e.g. mimicking old content) or a fault detected during quality control or review processes. All significant known issues must be noted here, or delays may be caused in subsequent processes.
Signing	Indicates whether the delivered program contains any in vision signing for the hard of hearing.



**Audio data**

Item	Description
Open captions	Indicates whether the delivered program contains any in vision subtitles and provides editorial description of the in vision subtitling employed within the delivered program in terms of its purpose, such as for the hard of hearing or language translation.
Textless elements exist	Indicates whether the delivered file includes any textless elements after the end of the program as Yes/No. These are typically clean backgrounds intended for credits.
Program has text	Indicates whether the main program has any text or is completely 'clean'. Text includes credits or chest captions for example.

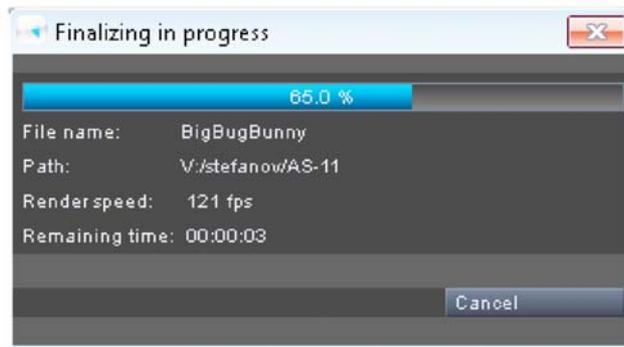
- In the fifth stage **CREATION**, select the data required for the finalization.



**Finalization data**

Item	Description
Render area	Render the entire timeline or only between in- and outpoints.
Render path	Specify the storage location for the created file.
Render name	AS-11 file name without extension.
Sidecar XML file	Specify, whether to create an additional sidecar XML.
Water-marking	Opens the watermarking tool, see "Forensic Watermarking" on page 347.
Summary	This field displays possible warnings and provides an overview of the program segmentation.

- Click on **Create** to finish the definition and start the transcoding process.
  - ▶ The progress of the conversion is indicated by a progress bar with some additional information:



An AS-11 file has been created.



## Finalizing Tool

Once a project is finished, you can generate from a project's timeline a new clip in a freely configurable format and raster without affecting the original material (original data and project file are preserved). This process is called finalizing and it can be made with the Finalizing Tool.



Contrary to the other delivery tools, the Finalizing Tool allows the unrestricted generation of any video and/or audio output format.

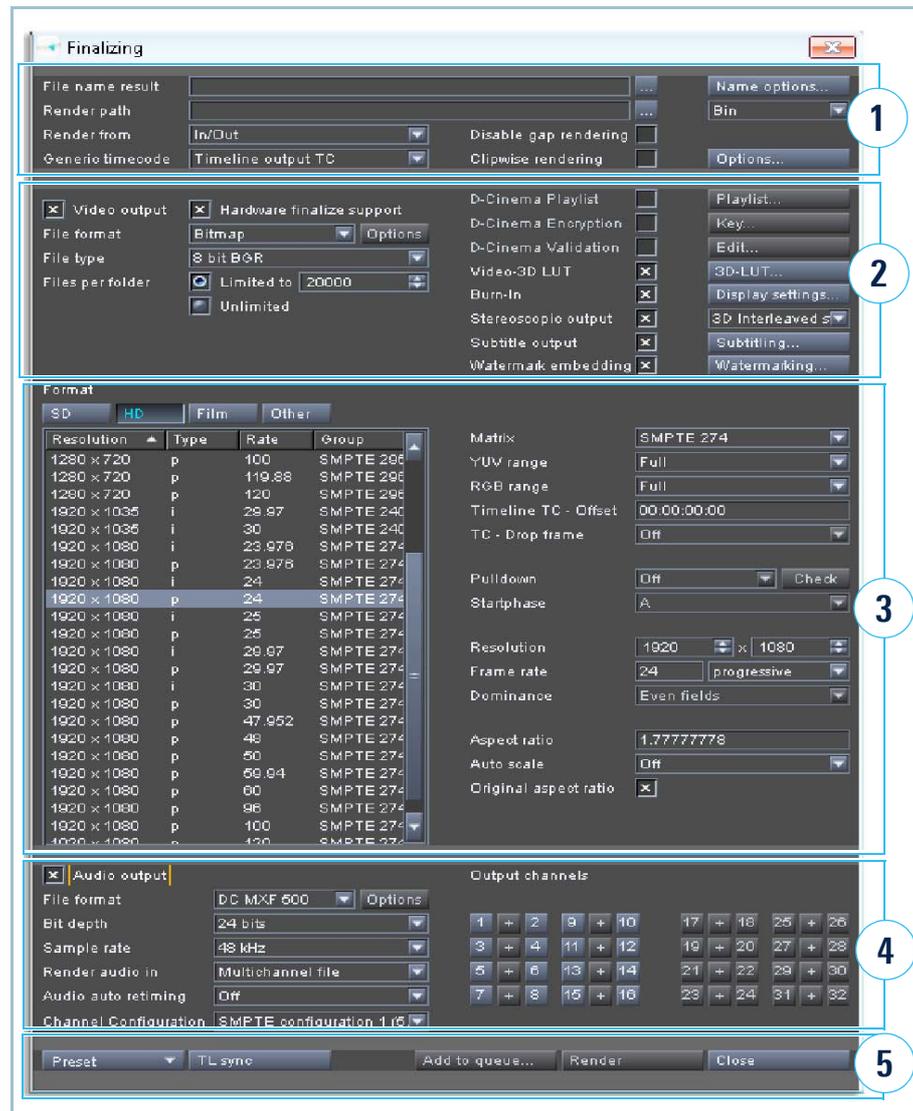
In addition, you may limit the rendering of the timeline within a defined in- and outpoint section or render video and audio separately.

The following topics are covered:

- User Interface Overview (page 324)
- General Settings (page 327)
- Video Output Settings (page 330)
- Video Format Settings (page 332)
- Audio Settings (page 336)
- Result Files (Files per Folder) (page 338)
- Using the Name Options (page 341)
- Batch Finalizing (page 345)

### User Interface Overview

The Finalizing Tool is started via **Project > Finalizing ...**. Now, the finalizing of the project loaded in the timeline can be configured.



Finalizing dialog

No.	Field	Description
1	General settings	Specifies some general settings for the output file.
2	Video output settings	Specifies the video settings for the rendering of the new clip.
3	Video format settings	Specifies the video format for the rendering of the new clip.
4	Audio output settings	Specifies the audio settings of the new clip.



No.	Field	Description
5	Button area	Buttons to control the finalizing tool.
		Via presets you can save and restore the settings of the delivery tool for often recurring jobs. Via the options on the <b>Preset</b> drop-down list you can create and administer the presets, e.g. load or save them. Recently used/loaded presets will be listed as well. You can also store the current setup of the delivery tool as a default. These settings will then be available for each new project.
		Sets the Delivery Tool to the same settings as currently set for the timeline.
		Adds the currently configured delivery type to a batch list for later processing. This button is available only in the last stage „Creation“
		Finalizes the video content with the applied settings.
		Closes the delivery tool without creating any content. However, already specified configurations will not be lost but stored during run-time.

## General Settings

When performing a finalizing you have to specify some general settings, such as the storage information and some timeline settings, first. They can be made with the settings items at the top of the window to configure a finalizing.



General settings for finalizing

### File name result

In the entry field File name result enter the name of the clip to be generated. You may also click on the button to the right of this entry field to select an already existing file.

Notation:	Standard file names of the Windows operating system, i.e. do not use the following characters: % / \ : * ? " < >   Furthermore, leave out the file extension.
Example:	Clip

However, instead of the entry field to set the file name you can also use the **Name options...** button to the right. With it you can endow the file name with variable information and/or adapt the numbering of the created image files.

The name options allow you to write certain details of your files to be created to the file names automatically. With them you can provide the file names with information such as the following (see also "Using the Name Options" on page 341):

Project name	Color space	File type
Video format	Bit depth	Sampling rate
Resolution	Aspect ratio	Date
Frame rate	File format	...



**Render path** In the entry field **Render path** you have to state the storage path where to store the new clip. You may also click on the button to the right of this entry field to select an already existing directory or create a new directory via the provided buttons of the opening dialog window. If the entered path does not exist, it will be created.

Notation:	drive_letter:\directory\subdirectory Instead of the backslash (\) you may also use a slash (/).
Example:	V:\tempest\act05\scene01

Regarding file name and path it would be sufficient for a rendering to enter a path in the field **Render path** and to state a file name. All other information necessary, such as the numbering of frames, will be added by the software automatically.

The combo box to the right of the **Render path** items determines if and where to create bin clips for the clips to be generated. It lists the folders that are available in the bin and, if one is selected, the generated clip(s) will be automatically sorted into this folder of the bin. If audio is rendered, these clips are registered as multi-clips and further subfolders will be created, each containing the individual clips used for the audio multi-clip. The option bin will create the bin clip(s) in the root folder of the bin, whereas the option none prevents the creation of bin clips.

**Render from** With the combo box **Render from** you can select whether the whole timeline (All) or the timeline stretch between the set in- and outpoint only (In/Out) should be rendered. If In/Out is selected but no in- and outpoint is defined in the timeline, the whole timeline will be rendered.

The check box **Disable gap rendering** determines whether gaps in the timeline of the CLIPSTER will be rendered or not. If deactivated, gaps present in the timeline will be rendered to black frames; when activated, they will not be rendered and the respective frames will be left out from the image sequence. A disabling of the gap rendering is available for still image formats only, meaning it will be ignored when rendering to a container file format.



## Generic timecode

With the combo box **Generic timecode** you select the timecode type that should be written as the source timecode into the files (if supported by the file format). During finalizing the selected timecode will then be written as the source timecode to the location in the files' headers especially reserved for that kind of meta-data. Afterwards the finalized clip will contain the selected source timecode and it can then be used by applications that support source timecode. The following settings are available:

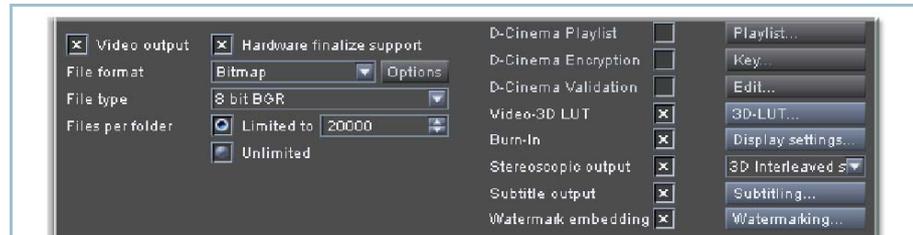
Timeline output TC	The internal timecode of the CLIPSTER's timeline is written to the correct location in the file headers, i.e. afterwards the internal timecode of the timeline is provided by the files as their source timecode.
Source TC	The source timecode provided by the clips already present in the timeline is written to the files' headers as their source timecode, i.e. if the clips already provided source timecode, it will be preserved. Clips without source timecode information may receive a virtual source timecode, see "Source Timecode" on page 28 and "Keycode" on page 29.

## Clipwise rendering

The **Clipwise rendering** items can be used, for example, to create digital deliverables. With them you can finalize the clips of the timeline to individual clips on the storage. When the check box is activated, for every reel in the timeline an individual clip in the selected file format will be created. In addition a corresponding Avid Log Exchange (ALE) file can be created which can be enabled/disabled as well as configured further with the **OPTIONS...** button to the right of the check box.

## Video Output Settings

With the settings items in the middle of the finalizing window you can specify the video format for the rendering of the new clip. To make these available, the check box **Video output** has to be marked.



Configuring video output

With the finalizing function of the Edit Tool you are able to generate video and audio files together or separately via the check boxes. When calling the finalizing window for the first time, the items for video and audio are disabled. Via the check box **Video output** you can enable the items for video and thus generate a video clip. The same can be done with the check box **Audio output**. By turning on either one of these only the activated output will be created.



If a container format is selected as the file format, you cannot generate audio and video separately. Both will automatically be included in the created file.

### Hardware finalize support

With **Hardware finalize support** you activate or deactivate the support of the R&S DVS PCI video board during finalizing. When activated and if possible, the video files will be rendered in hardware in a render speed faster than real time (depends on the applied operators and video formats involved). All real-time effects are supported. When deactivated, the finalizing will be made in software.



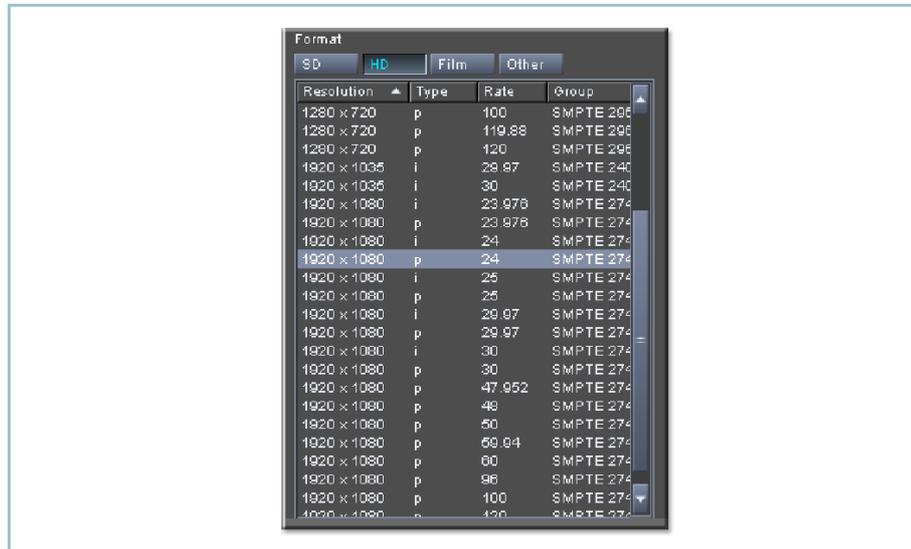
When finalizing to QuickTime, the available file types depend on whether the **Hardware finalize support** check box is enabled or disabled. 2K resolutions or above are supported when the **File type** combo box is not set to QuickTime Conversion.



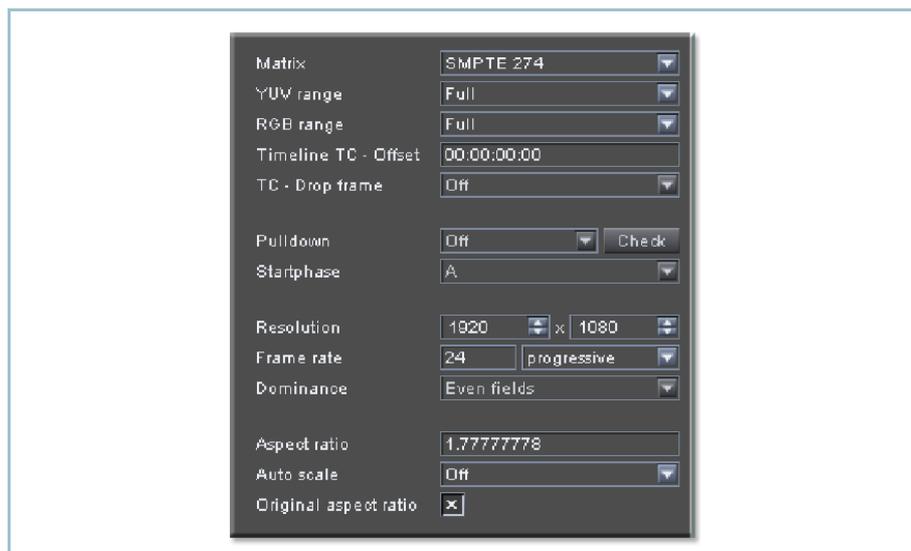
- File format** With the **File format** combo box select the file format for your clip to be generated. For a list of the supported file formats see "Supported File Formats" on page 491. To the right you can find the button **Options** which provides, depending on the selected format, further configurations for the files to be generated.
- File type** Depending on the selected file format additional codec or file types may be available (to determine bit depth and/or byte order settings). If provided by the format, select from the **File type** combo box the desired additional codec or file type.
- Files per folder** The items **Files per folder** allow you to limit the number of files that will be stored in one directory.
- Video-3D LUT** The **Video-3D LUT** items are optionally available. They are identical to the 3D LUT settings available for the timeline. A 3D LUT will not be applied automatically to the rendered files, even if one is set for the output of the timeline. In case you want to apply a 3D LUT (most probably the same you have set for the timeline), you have to select it here and activate it with the respective check box. For further information about how to do this refer to "Loading and Applying a 3D LUT File" on page 135.
- Burn-In** The **Burn-In** items are similar to the burn-in settings available for the video overlay and the video outputs. Any display settings already set for the video overlay/outputs will not be applied automatically to the rendered files. If you want to have burn-in information in the rendered images, you have to activate them with the respective check box and, if required, configure them to your liking with the button **DISPLAY SETTINGS....**

## Video Format Settings

On the left side of the area to configure video you can find some buttons and a list box to select one of the various video formats the system provides.



Choose one of the video format type buttons to display in the list box below the video formats sorted under this type. Then select from the list box the desired format that the project's timeline should be rendered to. The selected format will also be shown on the right side of the video configuration area in the editable resolution fields and, if appropriate, the pulldown/drop frame items will be made available.





The following options are provided:

<b>Matrix</b>	Determines the color conversion matrix that should be used if conversions between different color spaces and/or scalings between different value ranges are necessary. Usually, with a video format in SD CCIR 601 and with a video format in HD SMPTE 274 is selected.
<b>YUV/RGB range</b>	It specifies whether the color space range of the finalized clip will be in a restricted (Head) or in a full value range (Full)
<b>Timeline TC - Offset</b>	In the field <b>Timeline TC - Offset</b> select a timecode/frame offset for the rendered clip. It will be evaluated if for the clip to be generated a file format is selected that stores source timecode information in its header (e.g. *.dpx). Then the clip will provide this timecode offset in its source timecode.
<b>TC - Drop frame</b>	If appropriate and available, select whether drop-frame timecode should be applied to the source timecode written to the files with the <b>TC - Drop frame</b> combo box. It will be evaluated if for the clip to be generated a file format is selected that stores source timecode information in its header (e.g. *.dpx).
<b>Pulldown/ Startphase</b>	If appropriate and available, select the necessary pulldown method from the <b>Pulldown</b> and <b>Startphase</b> combo boxes. The pulldown feature may be necessary when working with film-originated material and offers a film-to-NTSC conversion: It renders, for example, video data that is in 24 progressive frames/sec. (film) as 30 interlaced frames/sec. (NTSC). <b>NOTE:</b> To use this feature, the video track(s) of the timeline should contain 24p material only. With the <b>Check</b> button to the right you can ascertain that all material in the timeline is in this format. Prior to using pulldown it is recommended to check the timeline with this button.



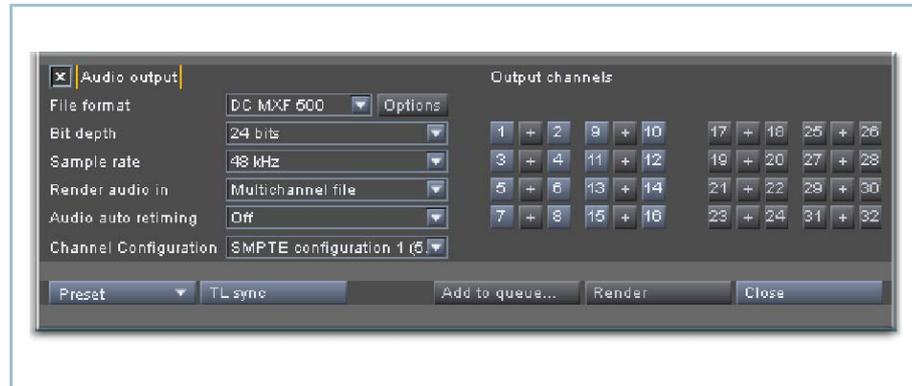
<b>Resolution</b>	With the fields regarding the resolution of the rendering you set the actual output resolution of the clip to be rendered and generated. You can alter the resolution to any format you like and the new clip will be present in this resolution. Use the resolution fields to change the height and width of the clip.
<b>Frame rate</b>	<p>The <b>Frame rate</b> entry field will be evaluated if a file format is selected that stores source timecode information in its header (e.g. *.dpx). Then the specified timecode will provide the entered frame rate as the source timecode's frame rate.</p> <p>Use the combo box for the field mode to select whether your material to be generated should be interlaced, progressive or segmented frames.</p>
<b>Dominance</b>	From the combo box <b>Dominance</b> select the dominance of your interlaced material. The <code>Odd fields</code> value starts with the second video field of the interlaced image while the value <code>Even fields</code> begins with the first video field.



<b>Aspect ratio</b>	Change the aspect ratio of your image content and thus compress or stretch the image. The aspect ratio value should be entered as the value of the x-axis divided by the y-axis.
<b>Auto scale / Original aspect ratio</b>	<p>Allow to scale and resize your original video material. Both settings are concerned with the video format of the clips in the timeline, and their output for the clip to be rendered must be seen in relation to the selected video format of the new clip:</p> <ul style="list-style-type: none"><li>■ With the combo box <b>Auto scale</b> set to <b>Fit</b> and the <b>Original aspect ratio</b> check box activated, the clips of the timeline will be scaled to their maximum allowable width or height so that no information gets lost. If the aspect ratio is different, you will receive black bars in the finalized images.</li><li>■ With this combo box set to <b>Crop</b> and the <b>Original aspect ratio</b> check box activated, the images will be scaled to their maximum allowable width or height so that you receive a full image at the output. If the aspect ration is different, parts of the images may be cropped.</li><li>■ With the <b>Auto scale</b> setting set to <b>Off</b>, the material will maintain its original size.</li><li>■ With the combo box <b>Auto scale</b> set to <b>Fit</b> or <b>Crop</b> and the <b>Original aspect ratio</b> check box deactivated, the aspect ratio (the relation of width (x) and height (y) of the video format) will not be preserved. The resulting images will be stretched or compressed if the aspect ratio is different and you will always receive a full image at the output.</li></ul>

## Audio Settings

The settings items at the bottom of the finalizing window allow you to configure a finalizing of audio. To make them available, the check box **Audio output** has to be marked.



Configuring audio

**File format** With the **File format** combo box select the file format of your audio file(s) to be generated. For a list of the supported file formats see "Supported File Formats" on page 491. To the right of the **File format** combo box you can find the button **OPTIONS** which provides, depending on the selected format, further configurations for the files to be generated.

**Bit depth** From the **Bit depth** combo box select the bit depth of the audio files. The software supports all common bit depths (depending on the selected file format).

**Render audio in** Use the **Render audio in** combo box to determine the output format of your files, i.e. whether they should be rendered to individual mono or stereo files, or a single file containing multiple channels (depending on the selected file format).

**Audio auto retiming** Audio that is available in the timeline can be re-timed (i.e. time stretched or time compressed) between different frame rates (e.g. 23.976 Hz, 24 Hz and 25 Hz). For this select from the **Audio auto retiming** combo box the appropriate option. When activated, a retiming will be performed automatically during finalizing with respect to the frame rate of the selected video format. However, please note that this feature provides no pitch control and should therefore be used for slight timing changes only.

### Channel Configuration

Some file formats such as MXF can store in their file headers information about the audio channel configuration. It will then be used by players to recognize and map/rout the included audio material correctly. If available, select from the combo box **Channel Configuration** the audio channel configuration (e.g. SMPTE or D-BOX) that matches your audio setup in the timeline. The D-BOX settings allow you to integrate control data in the finalizing for a motion control of seats.

### Output channels

With the buttons of the area **Output channels** you have to select the audio channels for the finalized output. An activated **+** button between two channels configures the two channels to stereo. The audio channels of this area are directly related to the audio channel output settings of the timeline (see "Audio Output Configuration" on page 130): They will render whatever audio track is set to the respective output channels

#### Example:

The audio track 5 and 6 of the CLIPSTER contain each audio with different contents. Both tracks are configured to an output of channel 1 and 2. In the **'Finalizing'** window select the channels 1 and 2 for the audio file generation. This will result in an audio file that contains the mixed contents of the audio tracks 5 and 6.

Audio track of CLIPSTER	5	6
Output routing of tracks	channels 1 + 2	channels 1 + 2
Output settings in <b>'Finalizing'</b> window	channels 1 + 2	
Results in file containing ...	... the mixed contents of audio track 5 and 6	

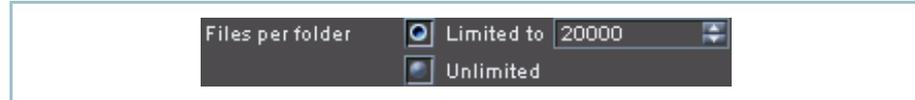


The hardware of the R&S DVS system is capable of outputting 16 different audio channels. For a finalizing there are another 16 audio channels available (32 channels in total), because some audio file formats can handle more than 16 channels.



## Result Files (Files per Folder)

The result (output) of a finalizing depends to some extent on the setting of the **Files per folder** items. They allow you to configure the number of files that will be stored in one directory.



By default the files per folder items are set to 20,000 frames because this is an appropriate value for the file system of the operating system. Values below 1,000 files cannot be set. By activating the **Unlimited** setting no further subdirectories will be created and the rendered files will all be stored in the first generated subdirectory as described below.

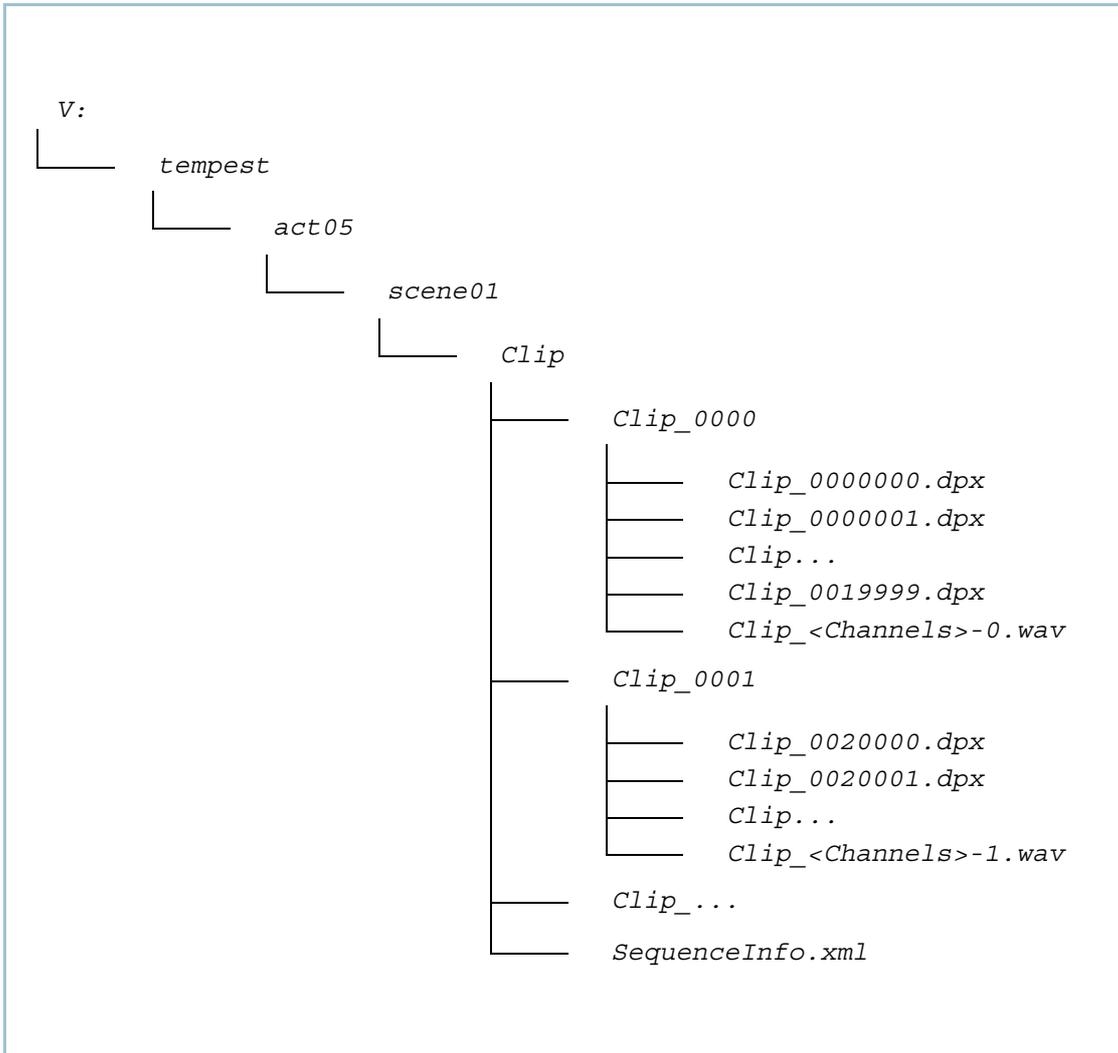
### NOTICE

#### System Instability

Windows may cause problems if more than 20,000 files are stored in one directory.

**Use the Unlimited setting only when you are sure that your rendering causes less than 20,000 frames.**

Example output on the storage with \*.dpx as video output format and \*.wav as audio output format:



In the path `V:\tempest\act05\scene01` a directory will be created carrying the name `Clip`. Beneath it a subdirectory will be created with the name `Clip_0000`. In this subdirectory the first 20,000 frames of the finalizing will be stored.

The file name of the first frame of your rendered timeline will be `Clip_0000000.dpx`. The number in the file name will increase by one with every generated frame (file/frame number). If the 20,000th frame is reached, the CLIPSTER will again create a subdirectory (`Clip_0001`) in the selected path and start the generation of the next 20,000 frames, and so on until the project is rendered completely according to your settings.



The file/frame numbering can be configured with the name options items (see section "Using the Name Options" on page 341). Normally the count will start with 0 with the amount of digits depending on the amount of frames to be finalized.

The matching audio files will be stored in these subdirectories as well, meaning the audio files will be appropriately cut to match the length of video stored in this folder. The place holder `<Channels>` in the file names of the audio files above indicates the selected audio channels of the area **Channels** when individual mono or stereo files are created. When a multiple channel file is generated, the `<Channels>` place holder will be left out.

When video (still image sequence) or audio clips are finalized or recorded, an additional file with the name `SequenceInfo.xml` is created in the main directory of the clip. It is used by the DVS software to enable a recognition of multi-clips with different **Files per folder** settings, for example, during a drag-and-drop procedure to the bin.



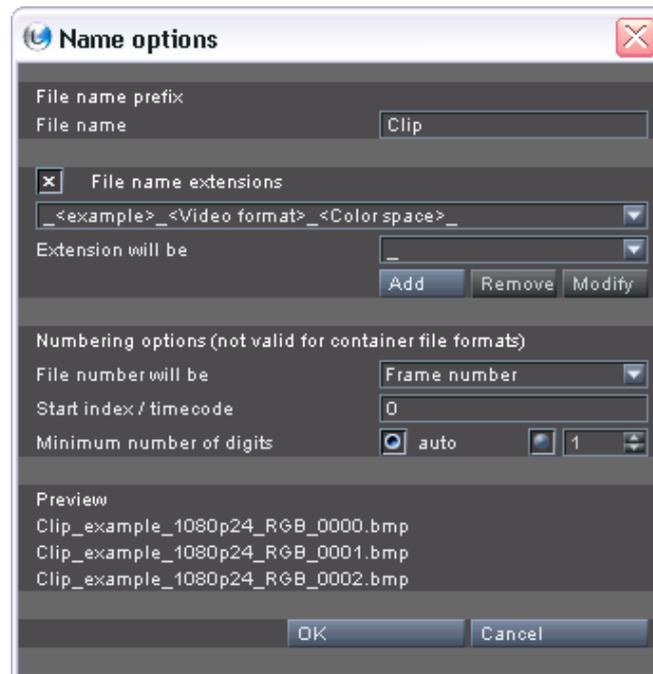
If a container format is selected as the file format, the file will be stored in the main directory, i.e. under `Clip`.

## Using the Name Options

With the name options you can adapt other name related options such as the numbering of the individual image files:

Perform the following steps:

1. Click on the button **NAME OPTIONS...** in the finalize dialog.  
 ▶ The following window opens:



2. If not already set as desired enter a file name prefix in the entry field **File name**.
3. By activating or deactivating the **File name extensions** check box you can add variable and/or static components to the file names:



combo box	<p>The upper combo box is used to assemble the file name extensions. By positioning the cursor or marking variables/separators via a double-click of the mouse in this field, the extensions can be assembled or edited using the items described below.</p> <p>Additionally, the drop-down list of this combo box provides some predefined extensions. The last ten assembled and confirmed name extensions can be found here as well. They will be available for the duration of the project and saved together with the project file.</p>
<b>Extension will be</b>	<p>Select from this combo box the variable or separator that should be transferred to the upper combo box. The variables will be replaced during the operation with the respective data. If none is available, 'Unknown' will be output.</p> <p>The variable <code>Customized</code> can be used for user-defined strings: With <code>Customized</code> selected the user-defined string can be entered in this combo box and then transferred to the upper one with the button <b>ADD</b>.</p>
<b>ADD</b>	<p>Use this button to transfer the selected extension to the upper combo box. It will be inserted at the current cursor position.</p>
<b>REMOVE</b>	<p>By double-clicking (marking) variables or separators in the upper combo box they can be deleted with this button. To delete extensions even without marking, you may also use the respective keys on your keyboard, i.e. [Backspace] and [Del].</p>

## MODIFY

This button will be available when a user-defined string (variable `Customized`) is double-clicked (marked) in the upper combo box. Then you can edit the text of this string in the field **Extension will be**. When finished, the marked extension in the upper combo box can be replaced with the edited text by clicking the **MODIFY** button.



The other variables can be modified by double-clicking them in the upper combo box and selecting another one from the combo box

**Extension will be.**

4. Use the **Numbering options** to configure a file numbering for the image files to be created:



<b>File number will be</b>	Select from this combo box what should be used to create the file numbers. You can select between a consecutive numbering of frames, the internal timecode of the CLIPSTER or the timeline's output timecode. When using one of the timecode settings the respective timecode will be recalculated in frames. This value is then used for the numbering.
<b>Start index/time-code</b>	When <code>Frame number</code> or <code>Internal TC</code> is selected in the combo box <b>File number will be</b> , you can enter in this field the starting point for the numbering, i.e. with it you can offset the frame number in the file names of the image files. It can be entered either in frames or timecode notation depending on the selected <b>File number will be</b> setting.
<b>Minimum number of digits</b>	With these radio buttons you can determine the minimum amount of digits that the numbering should provide. Either you let the DVS software decide how many digits the file numbering should provide ( <b>auto</b> ) or you set it manually with the entry field to the right.

- ▶ A preview of the file name can be seen below the items to set a numbering. For example, when as a file name prefix `scene` is entered and as the file extension `_<Date>_<Video format>_<Color space>_` is specified with a 5-digit numbering, you may receive an output like the following: `scene_20090101_1080p24_RGB_00000.dpx`

5. Once the file names are set as desired click the **OK** button:
  - ▶ This will close the window to configure the name options and you will be returned to the finalize dialog.

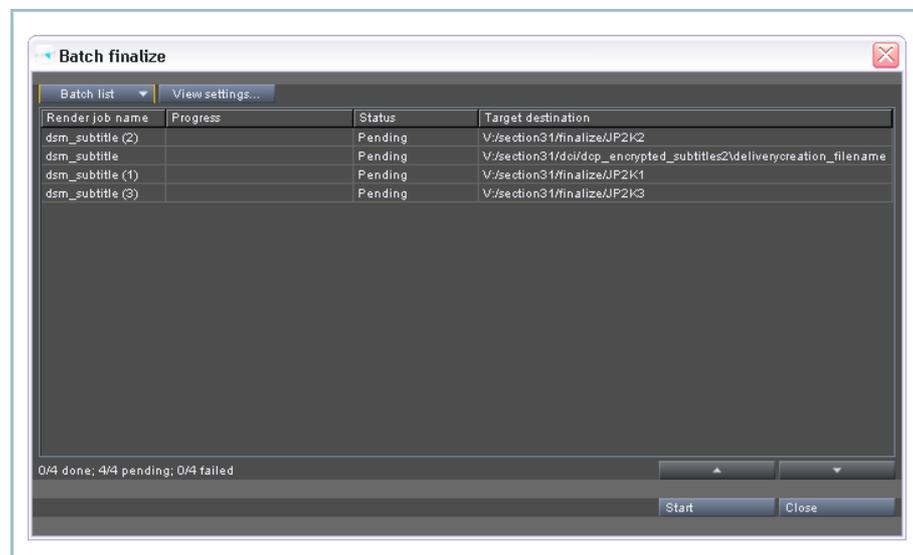
With this the configured file naming will be detailed in the finalize dialog accordingly (entry field **File name result**). When the **File name extensions** were activated via their check box in the name options, the field **File name result** will be unavailable. The set name options will be applied to the generated files as soon as the rendering is initialized.

## Batch Finalizing

When e.g. in the **'Finalizing'** window or the digital cinema delivery tool, finalize jobs can be added to a batch list via the button **ADD TO QUEUE....** With this you can postpone the rendering of a single job until there is time for it or when you want to render multiple jobs one after another in a single step.

Before adding a job to the batch finalize list you have to specify all relevant output/finalize settings. Then use the button **ADD TO QUEUE...** to add the job to the batch list.

Afterwards the **'Batch finalize'** window will be displayed in the background. It can also be called via the menu option **Batch Finalize...** of the **Project** menu:



Viewing, setting and starting batch finalize jobs

### NOTICE

#### Overwriting Files

During a batch finalizing already existing files with the same file name in the specified path will be overwritten.

**Be careful when specifying target paths and file names.**

In this window you will see all specified jobs, their statuses as well as some output settings. You can change the sequence of the jobs via drag and drop or via the arrow buttons to the right-hand side below the list. To delete one or more jobs, select them and press [Del] on the keyboard or use the menu option **Delete** on the context menu of a job



The **Batch list** combo box at the top left of the window provides options to save or load a batch finalize list. Recently used batch finalize lists will be listed as well. With the button **VIEW SETTINGS...** you can adapt the columns of the job list to your requirements.

By double-clicking a job in the batch list the corresponding project file will be automatically loaded and the respective finalizing tool of the CLIPSTER will show you the settings of the selected job.

Once all jobs are specified and added to the batch, the batch finalize process can be started via the button **START**. The DVS software will then render one job after another until all jobs are completed.

Successfully rendered jobs will be indicated in blue, while failed ones are marked in red. With a right-click of the mouse on a failed job you can select the menu option **Show error message** which will show the corresponding warning message providing more details about the failed job.



The batch finalize list and its specified jobs are not saved in a project file. Instead it can be stored as a global setting or via the options provided by the Batch list combo box.

## Forensic Watermarking

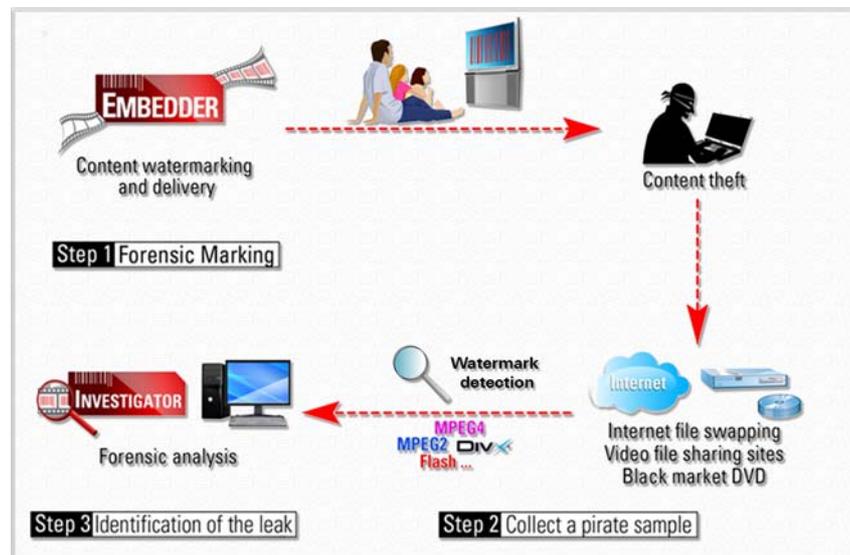
This section describes the forensic watermarking feature integrated in CLIPSTER. CLIPSTER supports the NexGuard watermarking solution by Civolution, which is available as an optional feature.

The following topics are covered:

- Understanding Forensic Watermarking (page 347)
- Watermarking with CLIPSTER (page 348)
- Configuring the Watermarking (page 351)
- Enabling the Watermarking (page 354)
- Performing the Watermarking (page 355)

### Understanding Forensic Watermarking

A forensic watermark is an image filter embedded into a video content. It provides a unique, imperceptible and non-removable identifier to help copyright holders detect illegal use and identify piracy sources.



Watermark ID identification (image provided by courtesy of Civolution)



Civolution's NexGuard provides forensic protection with a centralized database of watermark data to unify watermarking data across multiple content providers. The watermark embedding can be applied to a variety of video formats at any stage of the video distribution chain:

- Content watermarking in post-production, preview and distribution.
- Traceability of Illegal copies to a specific cinema, and the date/time of projection.
- VOD and pay-TV content protection on any output device.

The watermark is imperceptible to the human eye. It does not alter the video and can be recognized only by a special software. Several minutes of outputting the video on any screen device will be sufficient to recognize the watermark.



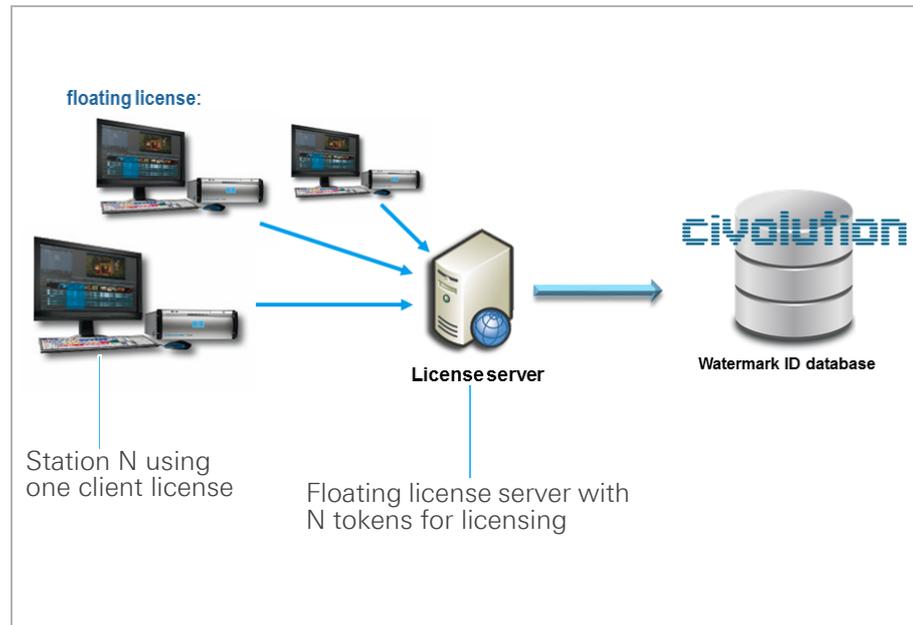
The forensic watermark remains unaffected even through recording, manipulation, editing, compression and decompression, encryption, decryption and broadcast. The conversion of the original source into various watermarked formats does not affect the quality of the content.

## Watermarking with CLIPSTER

Most of the metadata pertaining to a video to be watermarked (such as title or recipient) are predefined in a local customer database which is set up with the NexGuard Manager provided by Civolution. Through this manager system the R&S DVS software is connected to Civolution's server to transfer the watermark-related metadata (incl. title, recipient) and watermark ID into a centralized database. The ID is automatically requested as soon as the transcoding task is started. The ID is automatically sent along with the metadata as a log file as soon as the transcoding task is completed.

### Floating License Model

NexGuard uses a floating license model controlled by the NexGuard server to distribute license tokens among the CLIPSTER stations.



Each watermarking station receives a single client license. When the number of used tokens (for example: N tokens) reach the N limit (N is set during license generation), no additional station is allowed to use its licensed plugin. When a station releases a token (by releasing the plugin in the transcoder application), another station can use it.



When using floating licenses, and all available licenses are occupied, you must wait until a license is free to use. You are notified through the software user interface in case connection fails or a license token is unavailable.

In order to connect to the Civolution's database through the NexGuard Manager, a specific IP, a device ID and the location of the licenses have to be correctly entered in CLIPSTER's Configuration Tool, see "Configuring the Watermarking" on page 351. Refer also to the NexGuard documentation shipped out with your system.

**NOTICE****Missing License**

You can obtain the license path from your administrator or you can even create a license folder yourself to store the NexGuard licenses.

**Please bare in mind that the license folder must be always outside the installation folder of CLIPSTER, otherwise the license will be missing after each update of the system.**

**File Format Limitations**

NexGuard can be applied to a variety of output video file formats supported by CLIPSTER, however, there are some restrictions.

**NOTICE****Unsupported File Formats**

Observe the following restrictions concerning watermarking for the time being:

- single frame file formats are not supported (incl. DPX).
- dual stream 3D and interleaved 3D are not supported.
- v210 data formats only work with a line length that can be divided by 48.



A complete list with all supported formats for watermarking with CLIPSTER can be found in section "Supported File Formats for Watermarking" on page 499.

**Rerendering**

When generating supplemental packages such as supplemental IMPs or DCPs, CLIPSTER does not create a copy of the original files, but rather links to them and renders only the new additional ones thus saving computing time and disk space.



With NexGuard, however, a unique watermark is generated for every single transcoding task. Thus, each generated copy - including the original files in supplemental packages - must be rerendered in order to receive a unique watermark ID. Please bare in mind that computing time will increase in such cases.

Watermarking can be performed with every file-to-file transcoding task in CLIPSTER i.e. it can be enabled in every finalizing Wizard:

- Finalizing Tool

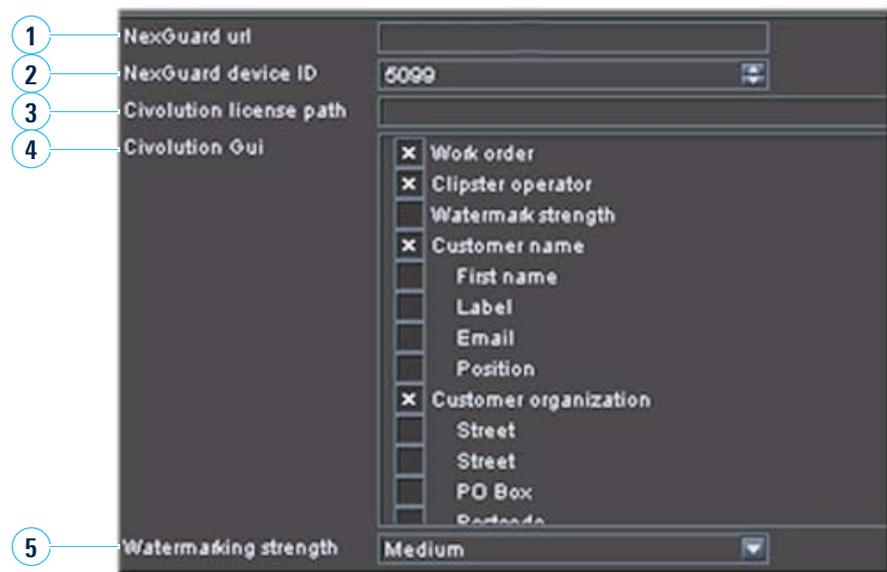
- Digital Cinema Delivery Tool
- IMF Delivery Tool
- AS-02 Delivery Tool
- AS-11 Delivery Tool

## Configuring the Watermarking

Configuring the watermarking feature as well as obtaining the NexGuard license is done in the Configuration Tool.

Perform the following steps:

1. Open the Configuration Tool and select **Defaults > Watermarking**.
2. Enter the required information as follows:

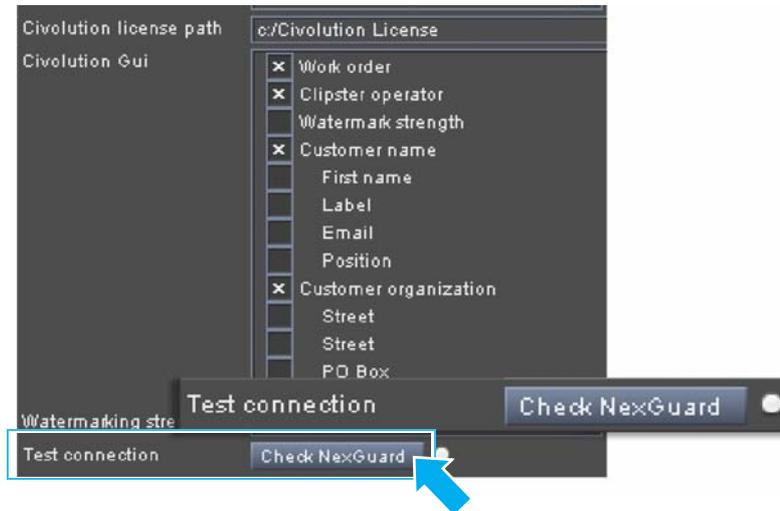


1	NexGuard url	
2	NexGuard device ID	5099
3	Civolution license path	
4	Civolution Gui	<input checked="" type="checkbox"/> Work order <input checked="" type="checkbox"/> Clipster operator <input type="checkbox"/> Watermark strength <input checked="" type="checkbox"/> Customer name <input type="checkbox"/> First name <input type="checkbox"/> Label <input type="checkbox"/> Email <input type="checkbox"/> Position <input checked="" type="checkbox"/> Customer organization <input type="checkbox"/> Street <input type="checkbox"/> Street <input type="checkbox"/> PO Box <input type="checkbox"/> Barcode
5	Watermarking strength	Medium



No	Item	Description
1	<b>NEXGUARD URL</b>	Enter the IP address of the Virtual Machine the NexGuard Manager is hosted on. Check the NexGuard Manager or ask your administrator how to obtain it.
2	<b>NEXGUARD DEVICE ID</b>	Enter the associated Device ID that has been assigned in the NexGuard Manager for the associated redering station. The device ID represents both your station and the NexGuard license.
3	<b>CIVOLUTION LICENSE PATH</b>	To obtain a license token, browse to the path where the NexGuard license is stored and select it (usually <b>C:\Civolution license</b> )
4	<b>CIVOLUTION GUI</b>	Specify the items of the user interface shown in the <b>CIVOLUTION NEXGUARD VIDEO WATERMARKING</b> window.
5	<b>WATERMARKING STRENGTH</b>	Specify the protection strength of the watermark. It is set to <b>MEDIUM</b> by default.

### 3. Verify the connection to the NexGuard Manager.



- ▶ If the connection has been established, the indicator will be green.

 Connected to NexGuard Manager. NexGuard license available.

- ▶ If the connection fails, the indicator will be red.

 No NexGuard Manager found. NexGuard license available.

#### ? Connection cannot be established?

- Verify that the NexGuard Manager is running.
- Check the URL of the NexGuard Manager.
- Verify the correct Device ID has been used.
- Check the Civolution license path if the message indicates that the license is unavailable.

### 4. Confirm with **OK**.

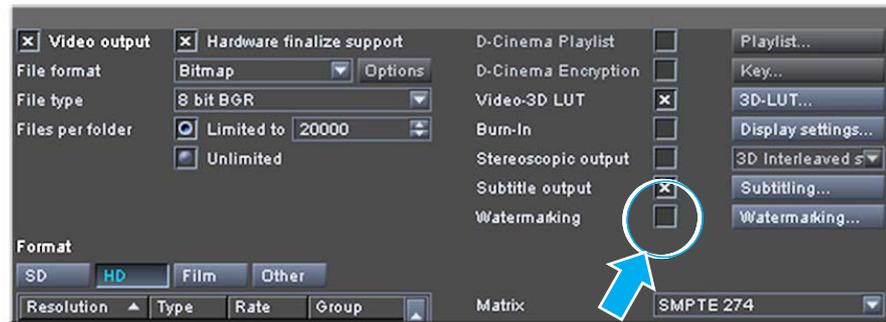
The watermarking feature in CLIPSTER is now set up.



## Enabling the Watermarking

Perform the following steps:

1. Open the required finalizing Wizard and set the conversion settings as desired.
2. Mark the check box **Watermarking** to enable the watermarking feature in the corresponding Wizard.



3. Click the **Watermarking...** button on the right to open the **CIVOLUTION NEXGUARD VIDEO WATERMARKING** window.
  - The settings dialog for the specific watermarking task opens. Here you can specify all required content details.

The watermarking feature is now enabled.

## Performing the Watermarking

Perform the following steps:

1. In the **CIVOLUTION NEXGUARD VIDEO WATERMARKING** window enter the required information.

The screenshot shows the 'Civolution NexGuard video watermarking' dialog box. It contains the following fields and buttons:

- 1. Work order (text input)
- 2. Clipster operator (text input)
- 3. Customer name (dropdown menu)
- 4. Customer organization (dropdown menu)
- 5. Content title (dropdown menu)
- 6. Episode (text input)
- 7. Episode number (text input)
- 8. Recipient name (dropdown menu)
- 9. Recipient organization (dropdown menu)
- 10. Update database (checkbox)
- 11. Check NexGuard (checkbox)
- 12. Ok (button)
- 13. Cancel (button)



No	Item	Description
1	<b>WORK ORDER</b>  <b>CLIPSTER OPERATOR</b>	<p>Enter the work order provided. The work order is the paperwork that is issued to instruct an operator to do some body of work. This number is generated by operations management and is printed onto the work order.</p> <p>Enter your initials. They will be associated with the watermark ID sent to the database.</p>
2	<b>CUSTOMER NAME</b>  <b>CUSTOMER ORGANIZATION</b>	<p>Select the name of the contractor person associated with this order.</p> <p>Name of the contractor organization associated with this order. Selected automatically depending on the Customer name selection.</p>
3	<b>CONTENT TITLE</b>	Select the title of the video content to be processed. If set in the Configuration tool, further information such as episode name or episode number can be displayed depending on the selection.
4	<b>RECIPIENT NAME</b>  <b>RECIPIENT ORGANIZATION</b>	<p>Select the name of the person to receive the converted package.</p> <p>Name of the organization to receive the converted package. Selected automatically depending on the Recipient name selection.</p> <p><b>NOTE:</b> The contract person/organization (e.g. copyright owner) will be in most cases different than the recipient (e.g. distributor).</p>



No	Item	Description
5	<b>UPDATE DATABASE</b>	In case some of the items above have missing predefined entries, the NexGuard database can be retroactively updated. Use this button to refresh the shown selections after the update. <b>Note:</b> additional entries can be added to the database by using NexGuard Manager web-based GUI.
6	<b>CHECK NEXGUARD</b>	Click this button to verify connection to the NexGuard server. If connection is established, the indicator is green. If there is no connection or no license is currently free or installed, then the following message appears: 

2. Confirm with **OK**.

Watermark settings are now prepared for the transcoding process. It will start automatically with the rendering process.





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# DCI Mastering

The aim of this chapter is to provide all the background information about DCI Mastering before starting to work with the Digital Cinema Delivery Tool. If you want to create Digital Cinema Packages right away then refer to section “Digital Cinema Delivery Tool” on page 264.

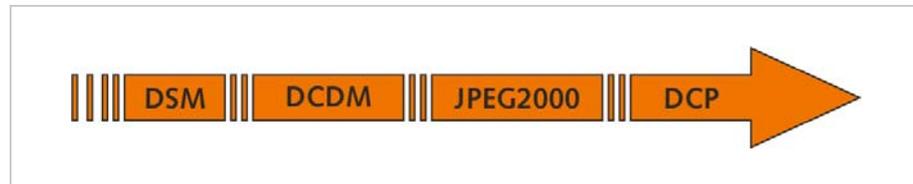
This chapter is divided into following sections:

- Understanding DCI Mastering (page 360)
- Possible Formats for DCI Mastering (page 363)
- Configuring the System for a DCP Creation (page 367)
- Preparing the Source Data (page 370)
- Adding Subtitles (page 374)
- Setting Reels (page 383)
- Supplemental DCPs (page 391)
- Validating a DCP (page 396)
- Using the DCP and Self KDM (page 400)
- The Keystore (page 406)
- Stereoscopic DCP (page 426)

## Understanding DCI Mastering

The generation of a Digital Cinema Package (DCP) consists of various steps and phases that can be easily accomplished with the DCI Mastering feature. These were outlined by DCI and with CLIPSTER you are totally free in your decision whether to make one of the intermediate steps towards a DCP, to finish an intermediate state to a DCP or to create a DCP in a single step. The individual steps that a DCP is composed of are explained shortly in the following.

### DCI Mastering Stages



Mastering stages

### Digital Source Master (DSM)

The first step to create a SMPTE/DCI compliant Distribution Package for digital cinemas is the Digital Source Master (DSM). With Post Production this step would be the same as with most projects: You simply have to assemble your project in the timeline of the Edit Tool and edit it as desired with, for example, trimmings, transitions, color corrections, etc.

The SMPTE as well as DCI clearly state that the Digital Source Master (DSM) itself is not defined, i.e. it may consist of any color space, pixel matrix (spatial), frame rate (temporal), bit depth and many other metrics' (SMPTE 428-1). Therefore, it lies totally in your own discretion how to prepare a project and thus the DSM. It is this master project that can then be converted to different formats for various applications, such as a Digital Cinema Distribution Master (DCDM), a home video master, a broadcast master, or a master for archiving.



For best results R&S DVS recommends that the timeline of a DSM in the Edit Tool consists of clips in the RGB color space only and that it is set to a digital cinema compliant frame rate.

## Digital Cinema Distribution Master (DCDM)

The Digital Cinema Distribution Master (DCDM) as the next phase for a DCP is deemed the exchange format by DCI for environments involved in the task to create D-Cinema content. It can be used as a complete and standardized format to communicate movies, for instance, between studio and post production.

To serve as a master and exchange format, the DCDM should be saved in very high quality (i.e. in 16-bit X'Y'Z' in the TIFF file format) with the resolution, frame rate and audio channel distribution of the later DCP, see also "Possible Formats for DCI Mastering" (page 363).

It is one of CLIPSTER's advantages that an explicit creation of a DCDM is not mandatory. With CLIPSTER a DCP can be made from a DSM directly and you do not have to make a DCDM first in order to get a DCP.



DCI suggested to store the DCDM in 12 bit padded to 16 bit that the SMPTE in their standards reduced to 12 bit altogether. For best results CLIPSTER will store the data in true 16 bit when creating a DCDM, meaning when the DSM is in 16 bit already, it will be stored in the DCDM in 16 bit as well and not rounded down to 12 bit.

## JPEG2000

For the sake of storage space and bandwidth the size of a DCP must be reduced so that it can be transported, saved and displayed without great efforts. For this the image files of the DCP will be converted to 12 bit (X'Y'Z') and then encoded with JPEG2000 (lossy compression). For maximum efficiency CLIPSTER encodes the image data with a variable bit rate (VBR). The audio data will not be compressed.

Same as with the DCDM, with CLIPSTER you do not have to create the JPEG2000 material explicitly to get a DCP. A DCP can be created from a DSM directly which will include the JPEG2000 compression automatically. However, if only the JPEG2000 encoded data is required, it can be created with CLIPSTER without difficulty.



The DCI specification limits the data rate for a successful presentation in a digital cinema theater to a file size of 1.302083 MB per 2K image at 24 frames per second, equivalent to a sustained data rate of 250 Mbit/s. For a frame rate of 48 fps, a 2K distribution should be set to a maximum of 651,041 bytes per frame (also 250 Mbit/s).



The settings of a JPEG2000 encoding are configured by default to this maximum data rate specified by DCI, i.e. to the highest quality normally allowed for a DCP. Other production methods, however, such as HFR (high frame rate), can also be configured for a DCP creation.

## Digital Cinema Package (DCP)

During the last stage of a DCP creation, the audio and JPEG2000 encoded image files will be wrapped (either encrypted or unencrypted) in the MXF format as the DCP's content delivery format.

This last phase in the creation of the final Digital Cinema Package (DCP) performs various steps itself: It will split the video/audio data into reels, encrypt the data (if wanted), wrap the audio and video reels separately in the MXF format, and generate the extra files for a DCP, such as the Composition Playlist (CPL), Key Delivery Message (KDM), Packing List (PKL), etc. With this you will get a D-Cinema compliant output that can then be sent to the theaters for which it has been created (if encrypted).

All this and the steps mentioned before (DCDM and JPEG2000) can be created with CLIPSTER from a DSM in a single step. But, of course, any intermediate step towards a DCP can also be converted to a DCP with the R&S DVS software easily.

For this you have to prepare your source material appropriately prior to the creation by determining reels, adding subtitles and configuring the key for CLIPSTER. This is in detail described in the following sections of this chapter.

## Possible Formats for DCI Mastering

This topic describes some formats for audio and video that are suitable for a DCP. They were taken from the respective SMPTE specifications. Please note that the video formats and the audio channel configurations listed here are only examples. Others (e.g. frame rates for video) are also specified by the SMPTE.



Please note that the formats for video and audio detailed in the following must be applied to a DCDM and JPEG2000 encoding (if created separately) as well as to the final DCP. For best results the DSM should have been created in the format of the final DCP already.

The following topics are covered:

- Video Formats (page 363)
- Audio Formats and Configurations (page 364)
- DCP Standards (page 365)

### Video Formats

The following lists the video formats that are suitable for a DCP:

No. of Active Horizontal Pixels	No. of Active Vertical Pixels	Aspect Ratio	Pixel Aspect Ratio	Frame Rate
4096	2160	1.90:1 (full)	1:1	24
4096	1716	2.39:1 (scope)	1:1	24
3996	2160	1.85:1 (flat)	1:1	24
2048	1080	1.90:1 (full)	1:1	24/48
2048	858	2.39:1 (scope)	1:1	24/48
1998	1080	1.85:1 (flat)	1:1	24/48



Other frame rates may also be valid for a DCP, e.g. 25, 30, 50, or 60 fps as specified in SMPTE 428-11.

If your source material is in a different aspect ratio than the ones detailed above, the material should be scaled for the digital cinema output so that it fits either vertically or horizontally in one of the full formats (thereby applying either letter- or pillarboxing).



## Audio Formats and Configurations

Audio should be saved in 24 bit at 48,000 Hz and the DCI specification suggests the WAV file format. For a SMPTE compliant DCI Mastering the routing of the audio tracks should be adapted in the Edit Tool as outlined in SMPTE 428-3 and 429-2. The table below shows audio channel configurations suitable for a DCP. They follow the SMPTE specification 429-2 (except for the D-BOX motion data which is detailed for sake of completeness).

Channel in package	Configuration				Notes
	5.1	6.1	7.1 DS	<b>7.1 SDDS</b>	
1	L	L	L	L	Far left screen loudspeaker (L)
2	R	R	R	R	Far right screen loudspeaker (R)
3	C	C	C	C	Center screen loudspeaker (C)
4	LFE	LFE	LFE	LFE	Screen low frequency effects subwoofer loudspeakers (LFE)
5	Ls	Ls	Ls	Ls	Left wall surround loudspeakers (Ls)
6	Rs	Rs	Rs	Rs	Right wall surround loudspeakers (Rs)
7	HI	Cs	Rls	Lc	Rear wall surround loudspeakers (Cs); mid-left to center screen loudspeaker (Lc); rear wall left loudspeaker/s (Rls)
8	VI-N	–	Rrs	Rc	Mid-right to center screen loudspeaker (Rc); rear wall right loudspeaker/s (Rrs)
9	–	HI	HI	HI	
10	–	VI-N	VI-N	VI-N	
11	–	–	–	–	
12	–	–	–	–	
13	Motion Data	Motion Data	Motion Data	Motion Data	Synchronous signal (currently used by D-Box)
14	–	–	–	–	

Channel in package	Configuration				Notes
	5.1	6.1	7.1 DS	<b>7.1 SDDS</b>	
15	–	–	–	–	
16	–	–	–	–	

For SMPTE Phase 2 DCPs (see "DCP Standards" on page 365) there is a labeling for the audio configuration in the DCP's meta-data available describing the positions of the audio channels in the surround sound. During the creation of a SMPTE Phase 2 DCP, it will be made automatically depending on the selected audio channel configuration, see also „Delivery Tools“ > „Stage 4: Delivery Format“ (Seite 276).

If you receive files for a DCP without any information about the audio channel configuration, you may assume (depending on the amount of audio channels) one of the above mentioned configurations as for surround sound the channel configuration is predetermined. If you suspect otherwise, you have to contact the original provider of the files to determine the audio channel configuration.

## DCP Standards

Until today, there have been several different DCP standards in use:

### SMPTE phases

<b>SMPTE Phase 0 (MPEG)</b>	Also called 'MPEG Interop' or 'MXF Interop'. This standard was originally defined by the MPEG Interop Group and is based on MPEG compressed files wrapped in MXF containers.
<b>SMPTE Phase 0 (JPEG)</b>	Also called 'JPEG Interop'. A transitional standard that is identical to the MPEG Interop standard but applies a JPEG2000 compression as proposed by DCI.
<b>SMPTE Phase 1</b>	This standard is based on JPEG Interop but uses different KDMs (i.e. SHA-256 instead of SHA-1).
<b>SMPTE Phase 2</b>	Also called 'SMPTE DCP'. Full compliance with SMPTE standards.



To create a DCP that can be viewed in a digital cinema theater, you should know which of the different standards/phases to apply to your DCP creation. With the DCI Mastering feature you can create DCPs in all standards:

- When using the digital cinema delivery tool, the respective SMPTE phase can be selected during the creation of the DCP (see section "Stage 5: CPL" (page 278). In every other case it has to be set via the Configuration Tool, see "Configuring the System for a DCP Creation" (page 367)
- For MPEG Interop (i.e. SMPTE Phase 0 (MPEG)) an MPEG compression has to be selected)
- For all other standards normally the JPEG compression must be selected.
- When using subtitles, there are further restrictions that must be observed for the different standards. They are detailed in "Adding Further Subtitles via Subtitle Tracks" (page 377).

## Configuring the System for a DCP Creation

For the creation of a DCP you have to make some general settings on the tab Defaults of the Configuration Tool of the DVS software and set, for example, the private key to sign the extra files of the DCP (i.e. CPL, KDMs and PKL).

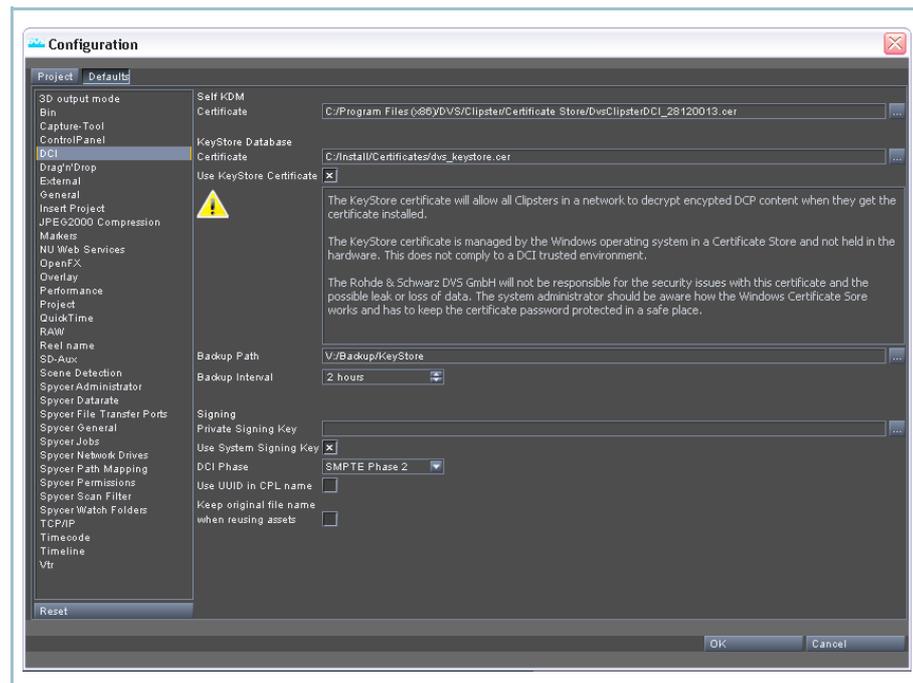


These settings are not required in case you want to create an intermediate step towards a DCP. They are applied during the generation of a DCP only.

Further information about the keys and certificates used during the creation and usage of a DCP can be found in "Keys and Certificates Explained" (page 417).

Perform the following steps:

1. Open the DCI settings in the Configuration Tool (menu **Options » Configuration defaults... » group DCI.**



2. Configure these settings according to your requirements:

Use the area **Self KDM** with the field **Certificate** to select the public key of a DVS CLIPSTER system that should be able to load the DCP, e.g. for quality checks. This public key will then be used during the creation of a DCP to generate a special KDM file (the self KDM). With this KDM you will be able to load the DCP on the respective CLIPSTER system (e.g. to view it, to create additional



KDMs of the same DCP at a later time, or to modify it). Select the file (\*.cer) that holds the public key of this CLIPSTER system with the button to the right of the field **Certificate**. For further information about the usage of the self KDM as well as its creation, see "Using the DCP and Self KDM" (page 400)".



This public key file can be found either already stored in the installation directory of the software on the respective system or on a separate CD-ROM.

- The KeyStore feature supplements the self KDM and makes the loading of encrypted D-Cinema material at the creator's site easier. For further information as well as the configurations available for this feature see "The Keystore" (page 406). Use the button on the right-hand side of the field **Private Signing Key** to select your own private key file (\*.pfx) that should be used to sign the extra files of the DCP (Signing Key). For this you may have to enter a password to authenticate your usage of the private key. It will be applied if the check box **Use System Signing Key** is deactivated. For further information about the Signing Key see "Signing Key" (page 419).



These settings are not required in case you want to create an intermediate step towards a DCP. They are applied during the generation of a DCP only.

Further information about the keys and certificates used during the creation and usage of a DCP can be found in "Keys and Certificates Explained" (page 417).

- By activating the check box **Use System Signing Key** you can override the setting **Private Signing Key**. Then the system will use a system specific Signing Key to sign the extra files of the DCP. For further information about this see "Signing Key" (page 419).
- With the **DCI Phase** combo box you select the standard that the DCP should be created in. When using the CLIPSTER, the respective SMPTE phase can also be selected while specifying the creation of the DCP. Further information about this can be found in DCP Standards (page 365).
- Activate the check box **Use UUID in CPL name** to get a shorter version for the file name of the CPL based on its UUID (universally unique identifier, file name syntax will be CPL\_<UUID>.xml). If deactivated, the file name of the DCP will be used.



- When reusing assets of a DCP, e.g. during the creation of a supplemental DCP, you can specify with the option **Keep original file name when reusing assets** that the original file name should be preserved.



## Preparing the Source Data

In order to create a DCP or one of its intermediate steps the available source data has to be prepared. Depending on the step from which to create the digital cinema content (see section "DCI Mastering Stages" on page 360) the source data has to be prepared differently.



When creating a delivery type other than a DCDM, all preprocessing steps, such as scalings or color corrections will be performed as well.

The following topics are covered:

- Preparing a DSM (page 370)
- Preparing a DCDM (page 371)
- Preparing JPEG2000 Data (page 372)

### Preparing a DSM

To create, for example, a DCP from the original DSM, you have to perform the following to prepare the source data:

Perform the following steps:

- If not already the case load the project that contains the DSM (video as well as audio) in the timeline.



It is recommended that the DSM consists of video clips in the RGB color space only and that the timeline is set to a D-Cinema compliant frame rate. Additionally, the routing of the audio tracks containing audio data should be configured to the final routing of the DCP. See also section "Possible Formats for DCI Mastering" on page 363.

## Preparing a DCDM

A DCDM is normally saved in X'Y'Z' in the TIFF file format. However, TIFF natively does not store the X'Y'Z' color space, it saves the RGB or Luma color space only. To use a DCDM for the creation of a DCP nevertheless, it must be properly prepared and available in the timeline of the Edit Tool:

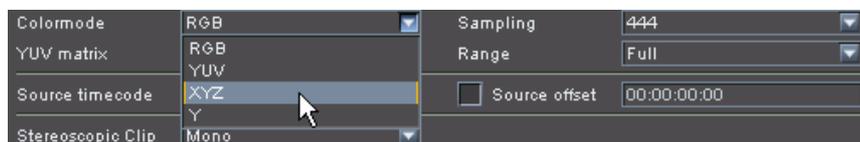
Perform the following steps:

1. Open a new project in the Edit Tool.
2. With the button **Settings...** of the timeline area configure the timeline output settings so that they match the format of the DCDM (normally the same as the final DCP format).
3. Add the DCDM clips (video as well as audio) to the bin, for example, by dragging them to the contents area of the bin from a file manager or by using the menu option Add clip... of the bin's context menu.
  - ▶ Afterwards the DCDM clips will be visible in the contents area of the bin. However, because the software registers the added video clip(s) as RGB clips (as stated in the images' file headers), you have to change the color space of the added clip(s) manually
4. Open the properties of the video clip(s) of the DCDM in the bin (context menu of bin clip » **Properties...**)
  - ▶ The properties window of the bin clip(s) will be displayed on the screen



The properties of several clips can be changed in a single step by selecting the clips in the bin and then opening their properties.

5. Set the color space settings to X'Y'Z' (XYZ) and confirm your alteration with the OK button.





Once X'Y'Z' has been selected as the color space, the color matrix setting (**YUV matrix**) will switch to the correct color matrix automatically. With this setting made, an automatic color space conversion from RGB to X'Y'Z' will be prevented during the creation of the DCP.

If your material is in YCxCz (i.e. it was processed with a YUV matrix beforehand), the color space setting must be set to YUV. Additionally, the appropriate YUV matrix that was used for the material during processing must be set manually (setting **YUV matrix**).

6. Next, add the video clip(s) of the DCDM to the video track(s) of the timeline.
7. Add the audio clip(s) of the DCDM to the audio tracks of the timeline.
8. If necessary adapt the routing of the audio tracks that now contain audio data so that they are suited for the DCP to be created (see section "Possible Formats for a DCI Mastering").

With this the DCDM clips are added to the timeline of the Edit Tool and they will be used for the creation of the digital cinema content.

## Preparing JPEG2000 Data

JPEG2000 data that is already adapted for digital cinema will normally be in the format of the final DCP in 12 bit X'Y'Z'. In so far it resembles a DCDM and thus the steps to prepare such data for the creation of a DCP are almost the same:

Perform the following steps:

1. Open a new project in the Edit Tool.
2. With the button **Settings...** of the timeline area configure the timeline output settings so that they match the format of the JPEG2000 data (normally the same as the final DCP format)



3. Add the required clips (video as well as audio) to the bin, for example, by dragging them to the contents area of the bin from a file manager or by using the menu option Add clip... of the bin's context menu.
  - ▶ Afterwards the clips will be visible in the contents area of the bin. Their properties are automatically set to the correct color space.
4. Add the JPEG2000 clip(s) to the video track(s) of the timeline.
5. Add the audio clip(s) to the audio tracks of the timeline.
6. If necessary adapt the routing of the audio tracks that now contain audio data so that they are suited for the DCP to be created.

With this the clips have been added to the timeline of the Edit Tool and they will be used for the creation of the DCP with the Delivery Tool, see "Digital Cinema Delivery Tool" (page 264)



## Adding Subtitles

This section describes how to use subtitles in the Edit Tool of the CLIPSTER software when creating a DCI-compliant package.

The following topics are covered:

- Subtitles in CLIPSTER for DCI Mastering (page 374)
- Adding a Subtitle via the Bin (page 375)
- Adding a Subtitle via an Empty Timeline Element (page 376)
- Adding Further Subtitles via Subtitle Tracks (page 377)
- Subtitle Timeline Element (page 378)
- Properties of a Subtitle Timeline Element (page 379)

### Subtitles in CLIPSTER for DCI Mastering

Working with subtitles in the Edit Tool is different from working with clips in the timeline: Subtitles have to be present in the timeline as a subtitle timeline element in an empty timeline track above the video timeline track(s). The subtitle timeline element, however, is just a container: It can be used for different subtitles, i.e. it may contain more than just one subtitle. For this, each subtitle timeline element provides up to seven subtitle tracks, where you can add the subtitles according to your needs (e.g. as main subtitle, main captions, closed subtitle, or closed captions).

To receive a subtitle timeline element in the timeline, you have several possibilities at hand:

- By adding an MXF/XML subtitle file to the bin and then to an empty timeline track
- By adding an empty subtitle timeline element to an empty timeline track and then reference it to one or more MXF/XML subtitle files



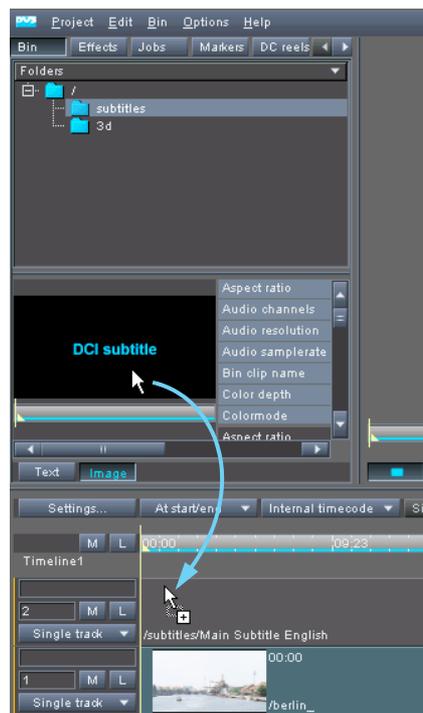
Subtitles can be placed at every position in the timeline, i.e. gaps between subtitle timeline elements are allowed.

## Adding a Subtitle via the Bin

An available MXF/XML subtitle file can be added to the bin and then to the timeline just as any other clip in the Edit Tool.

Perform the following steps:

1. Add the MXF/XML subtitle file to the bin, for example, via the **Add MXF/XML subtitle file** menu option on the **Project** menu (or on the context menu of the bin) or drag and drop it to the bin from a file manager.
2. Configure the timeline to show another empty video track, for example, via the timeline output settings or by using the menu option **Track » Add** on the context menu of a video track.
3. Then add the subtitle from the bin to the timeline by dragging and dropping it into the empty timeline track.



Contrary to video or audio clips, a subtitle timeline element does not have a connection to a bin clip. For example, the respective bin clip can be deleted without influencing the subtitle added to the timeline.

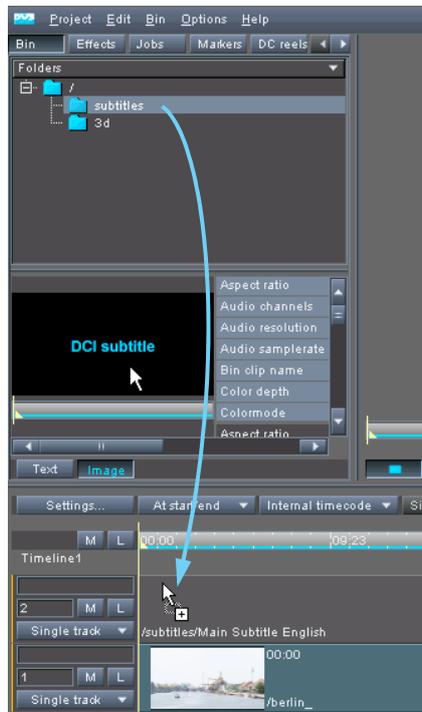
Subtitles are now added via the Bin.

## Adding a Subtitle via an Empty Timeline Element

To add subtitles, you can also use an empty timeline element. You can find the empty subtitle timeline element in the effects pane of the tool area:

Perform the following steps:

1. Configure the timeline to show another empty video track, for example, via the timeline output settings or by using the menu option **Track » Add** on the context menu of a video track.
2. In the tool area activate the tab **Effects**.
3. Select from the folder **SUBTITLING** the effects operator **DCI XML Subtitling** and drag and drop it to the empty timeline track.



The subtitle effects operator can also be used as the other effects operators, i.e. it can be added to the effects list of a video clip. However, the subtitles will be then valid for the clip only and when the clip is trimmed the subtitles are trimmed as well.

Subtitles are now added via an empty timeline element.

## Adding Further Subtitles via Subtitle Tracks

The subtitle timeline element visible in the timeline is just a container: It can be used for up to seven different subtitles. These must be added to subtitle tracks in the timeline element. This way you can add different subtitle types to your project (e.g. main subtitle, main captions, closed subtitle, or closed captions), all via a single timeline element. This section describes how to add a new subtitle track to a subtitle timeline element as well as how to reference it to a subtitle file.

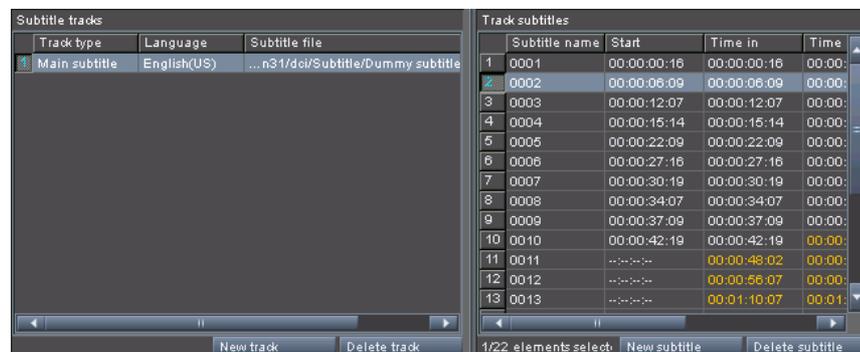
To add a subtitle via a subtitle track, you have to use the timeline element properties of the subtitle timeline element.



The subtitle tracks of a subtitle timeline element should not be used for different languages, see also "The Area 'Subtitle tracks'" (page 379).

Perform the following steps:

1. Either double-click the subtitle timeline element or call up its context menu and select the menu option **Show » Effect properties**.
  - ▶ This will display the timeline element properties of the subtitle timeline element:



- ▶ When an MXF/XML subtitle has been added via the bin (see "Adding a Subtitle via the Bin" (page 375)), you will find the MXF/XML subtitle file already entered in the area **Subtitle tracks** (column SUBTITLE FILE). Otherwise this table may be empty.
2. Use the button **New track** to add a subtitle track to the subtitle timeline element.
  3. Then double-click the field SUBTITLE FILE and enter the path to the MXF/XML subtitle file or use the button to the right to browse to it.



The button will be available when the field is double-clicked.

For MXF subtitles you may have to select \*.mxf from the **Files of type** combo box.

4. If necessary, adapt the fields `TRACK TYPE` and `LANGUAGE` to your requirements.



The fields `TRACK TYPE` and `LANGUAGE` must be filled in.

When using more than one subtitle timeline element in the timeline, each will provide the same number of tracks, and the track types as well as languages will be identical.

5. The subtitle types (field '`TRACK TYPE`') must be assigned with regard to the standard that the final DCP should be created in (see "DCP Standards" (page 365))

#### SMPTE phases

<b>SMPTE Phase 0</b>	'Main subtitle' and 'Closed captions' are allowed only.
<b>SMPTE Phase 1</b>	Same as SMPTE Phase 0
<b>SMPTE Phase 2</b>	All four types are allowed.
<b>All phases</b>	Only one shall be of the type 'Main subtitle'.

By performing the above mentioned steps repeatedly you can add the subtitles for your project to the subtitle timeline element.

## Subtitle Timeline Element

Once a subtitle timeline element has been added to the timeline, it can be handled just as any other timeline element (e.g. moved, cut or trimmed). A subtitle timeline element that has been added via a subtitle bin clip to the timeline will already have the length as determined by the MXF/XML subtitle file. When using an

empty subtitle timeline element (see section "Adding a Subtitle via an Empty Timeline Element" on page 376), it must be adjusted (trimmed) to the correct length.



The length of the subtitle timeline element can also be set with the field **Dur** of the timeline element properties.

Subtitles can be placed at every position in the timeline, i.e. gaps between subtitle timeline elements are allowed.

Any subtitles whose in- or outpoint are not available in the timeline (e.g. due to cutting or trimming) will be marked in orange in the area **TRACK SUBTITLES** (timeline element properties).

Via the menu option **Match » Subtitle** on the context menu of a timeline element you can display the timeline element properties of the respective subtitle. Additionally, the subtitle currently displayed in the video overlay (position of the timeline cursor) will be highlighted in the properties.

## Properties of a Subtitle Timeline Element

The timeline element properties of a subtitle timeline element (see also "Adding Further Subtitles via Subtitle Tracks" (page 377)) can be operated from left to right: First select the subtitle track that should be displayed in the properties then select the subtitle in the **Track subtitle** area. The respective subtitle images or lines will be displayed in the area **Subtitle elements**. When you select one of the subtitle elements, its appearance will be shown in the areas **Appearance settings** and **Position settings**.

### The Area 'Subtitle tracks'

A new subtitle track can be added as already described in "Adding Further Subtitles via Subtitle Tracks" (page 377) and it can be deleted with the button **Delete track**. Additionally, this area provides a context menu that can also be used to edit the subtitle tracks.

The concept of subtitles and subtitle tracks in the timeline of the Edit Tool is to have different subtitle types of a single language in a project. Thus, when using more than one subtitle timeline element in the timeline (e.g. for different reels), each will provide the same number of tracks. Moreover, they will be set to the same track type(s) and language(s) and will affect each other if a track is altered for one subtitle timeline element



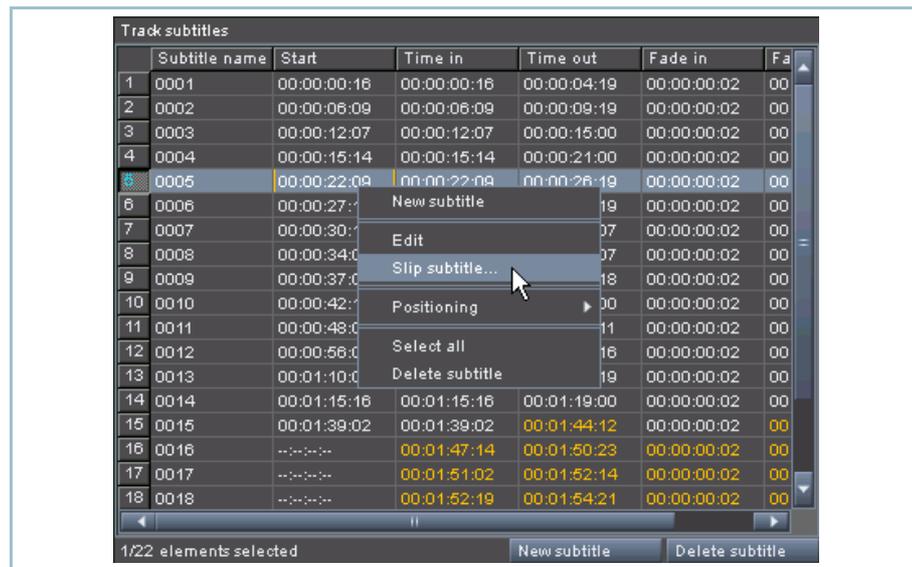
For subtitles in different languages you should exchange the subtitles and create supplemental DCPs for each language, see "Supplemental DCPs" on page 391

**The Area 'Track subtitles'**

The area **TRACK SUBTITLES** lists the in- and outpoints of the subtitles. Any subtitles whose in- or outpoint are not available in the timeline will be marked in orange. When a subtitle is selected with the mouse, the timeline cursor will automatically be positioned on the subtitle.

A subtitle can be deleted or a new one can be created with the buttons **Delete subtitle** and **New subtitle** at the bottom right of this area. Furthermore, most values of a subtitle shown in the table can be changed after double-clicking a field.

The context menu of this area can also be used to edit the subtitles. It provides even further editing possibilities besides the ones already mentioned:



The subtitles of the track

**SMPTE phases**

**Slip subtitle...**

Allows you to adjust the in- and outpoints of subtitles in a single step. It can be used either on one subtitle, a selection of subtitles or on all.

**SMPTE phases**

<b>Positioning</b>	Determines where the timeline cursor will be positioned when a subtitle is selected from the list (e.g. at time in/out, after its fade in, before its fade out, or in the middle of a subtitle).
<b>Select all</b>	Select all subtitles in a single step.

**The Area 'Subtitle elements'**

Once a subtitle has been selected from the table TRACK SUBTITLES, its elements are displayed in the area SUBTITLE ELEMENTS: Either the subtitle text(s) or the path(s) to the PNG image(s)

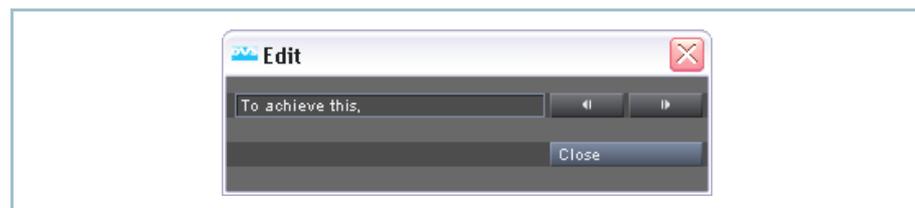


The elements of a subtitle

In this area you can also add further elements to a subtitle with the button **New Image** or **NEW IMAGE** or delete an already present subtitle element with the button **DELETE ELEMENT**.

A mixing of text subtitles with PNG images in one subtitle timeline element is not allowed.  
Currently only PNG images can be added to a subtitle timeline element.

To correct typos of a text subtitle, a light-weight editing can be performed. With this there is no need to go back to the subtitling tool in case a typing error has been found. After double-clicking a text subtitle or selecting the menu option **Edit** on the context menu, an editing window will be displayed on the screen:



Editing of a text subtitle

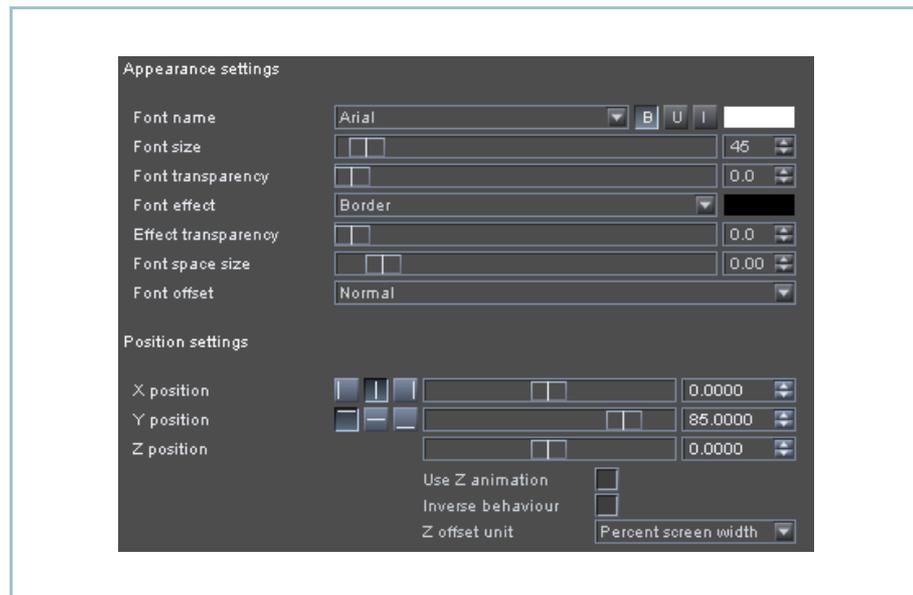


It will show you the text subtitle in segments if more than one formatting is present for the text, meaning an editing of a subtitle text is possible for contiguous characters with an identical text formatting only. You can switch to the adjacent characters/words that have another formatting with the buttons to the right of the text field. The changes to the text will be applied to the text subtitle immediately and they will be saved in the project file (neither the original file nor the bin clip are changed).

All of the above mentioned possibilities of the area Subtitle elements and more (i.e. Select all and Clear selection) can be found on the context menu of this area.

### The Areas 'Appearance settings' and 'Position settings'

When a subtitle element has been selected from the table **Subtitle elements**, its appearance is shown in the areas **Appearance settings** and **Position settings**. Then you can use these areas to change the appearance of the selected element, for example, you can set its position with the items of the area **Position settings**.



Appearance and position of a subtitle element



Currently the items of the area **Appearance settings** are for information reasons only.

The unit of the **Position settings** (x-, y- and z-position) is in percent. However, the unit of the **Z offset** (depth-animated subtitles) can be set to pixels.

## Setting Reels

To split the loaded or created project during the creation of the DCP into reels to comply with the requirements of a DCP, you have to define reels in the timeline: When wrapping to MXF (see "DCI Mastering" (page 359)), the finalized files will be automatically divided at the reel edit points in the timeline, resulting each in one MXF file per output format (video and audio).



The setting of DC reels is not required in case you want to create an intermediate step towards a DCP. DC reels are evaluated during the generation of a DCP only.

If creating a DCP with subtitles, you should place the reel edit points between two subtitles. However, apart from that, there are no restrictions where to place DC reels or to what length they should be set.

According to DCI it is common practice to divide a feature film into reels of a length between 10 and 20 minutes. According to SMPTE a reel must have a duration of at least one second.

Some digital cinema players may be unable to display reels that are shorter than 5 seconds.

This section covers the following topics:

- Setting Reels Automatically (page 384)
- Setting Reels Manually (page 386)
- Editing and Configuring the Reels (page 387)

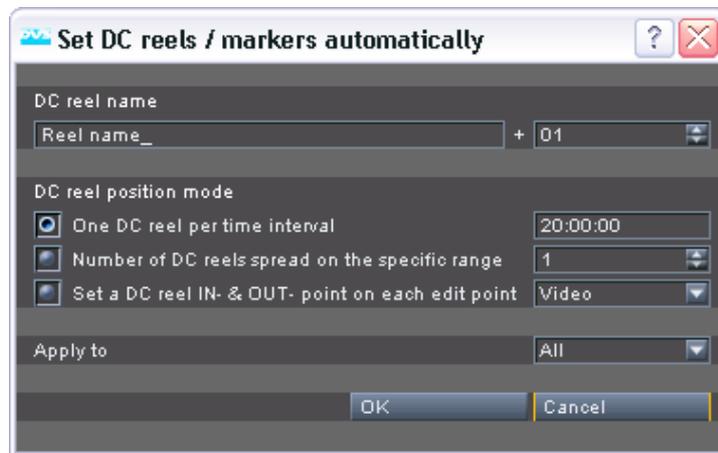


## Setting Reels Automatically

The reels for a DCP can be set automatically which is the most convenient way to do this. Afterwards the reels can be altered and configured to your liking manually.

Perform the following steps:

1. Select from the context menu of the timeline scale the menu option **Set DC reels automatically...**
  - ▶ This will switch the timeline area to the view of the DC reels automatically and the following window will be displayed on the screen.



- ▶ It provides the settings items as described below:

Item	Description
<b>DC reel name</b>	These two fields determine the names of the reels. The name prefix as entered in the field to the left will be used for each reel, supplemented by a consecutive numbering that can be configured with the field to the right (start number of the numbering).



Item	Description
<b>DC reel position mode</b>	Determines the way the reels should be generated. Via the radio buttons you can select between one of the following possibilities:
	<b>One DC reel per time interval:</b> With this setting you can set a fixed duration for the reels via the entry field to the right. The timeline/range will then be divided into reels of the stated duration (the last reel may be shorter).
	<b>Number of DC reels ...:</b> Use this setting to set a definite number of reels with the entry field to the right. The timeline/range will then be divided into this amount of reels of equal length.
	<b>Set a DC reel ...:</b> Use this setting and its combo box to specify that the video and/or audio clips available in the timeline should determine the reels. The reels' in- and outpoints will then be set at the edit points (cuts) of the clips.
<b>Apply to</b>	This setting allows you to limit the procedure. You can perform it either on all clips of the timeline or on the clips of a timeline range only, i.e. between a set in- and outpoint for the timeline.

2. Configure the creation of the reels according to your requirements and click **OK**.

This will start the creation of the reels and when finished, you can see them in the timeline area. After this they can be edited and configured to your liking as described in "Editing and Configuring the Reels" on page 387



## Setting Reels Manually

The reels for a DCP can also be set manually.

Perform the following steps:

1. Switch to the view of the DC reels by activating the toggle button **IN/OUT/DC REELS** of the timeline area.
  - ▶ When in the DC reels viewing mode, you can use the items to set the timeline's in- and outpoint to determine the DC reels. They can be used in exactly the same way to set the in- and outpoints of the DC reels:



2. Move the timeline cursor via its controls or manually to the position where the reel's inpoint should be set.
3. Press the button for the inpoint.
4. Perform the same for the reel's outpoint.
  - ▶ This will automatically create a DC reel in the timeline with the name `Reel_name_<no.>`. By performing the same procedure repeatedly you can create DC reels manually in the timeline. They can be created and edited in the following ways:
    - The reels will be formed by setting an inpoint as well as an outpoint.
    - The nearest, free and unobstructed (no already defined reel inbetween) in-/outpoint will be used to form a reel.
    - In-/outpoints can also be set by entering a number in the respective entry field and afterwards pressing [Enter].
    - Already determined reels can be altered by either setting a new in-/outpoint within an already defined reel (shortens the reel), or by setting a new in-/outpoint and deleting the old one (lengthens the reel).
    - When in the DC reels mode, reel in- and outpoints can be deleted the same way as deleting the timeline's in- and outpoint, i.e. by using the toggle button **DELETE**.

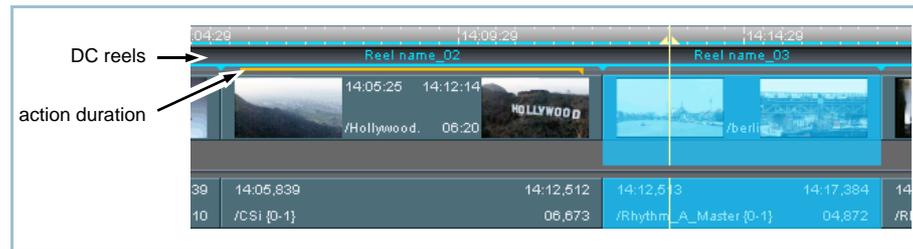
Once you are finished with the creation and setting of the DC reels, they can be edited and configured to your liking as described in section "Editing and Configuring the Reels".

## Editing and Configuring the Reels

By activating the toggle button **IN/OUT/DC REELS** you switch the timeline area to the viewing and editing mode for DC reels. This also activates the tab **DC reels** of the tool area.

### Editing Mode for DC Reels

In this mode you can view the DC reels as well as edit and configure them. The timeline area will then show you already set DC reels:



DC reels in the timeline are

The DC reels already defined in the timeline will be displayed in the timeline area with a blue line showing the name of the reel right above it. Once the timeline cursor is placed inside a reel, the respective timeline stretch between its in- and outpoint will be highlighted in blue.

With the timeline area switched to the DC reels mode you can set new DC reels manually or edit already determined ones as indicated in "Setting Reels Manually" (page 386). Newly created reel in- and outpoints, when not assigned to a reel already, will be shown in the timeline with an in-/outpoint marker without the blue line.

Apart from editing already determined reels manually in the timeline, they can also be configured with the tab **DC reels** of the tool area as well as with some menu options of the context menu of the timeline scale. Both possibilities will be described in the following.

### The 'DC Reels' Tab

Already set reels can be configured with the tab **DC reels** of the tool area:



Bin	Effects	Jobs	Markers	DC reels	Perform		
	Reel name / Content	Reel In	Reel Out	Reel duration	Action In	Action Out	Action duration
1	Reel name_01	14:00:00	14:05:25	05:25	14:00:00	14:05:25	05:25
2	Reel name_02	14:05:25	14:12:15	06:20	14:06:05	14:12:05	06:20
3	Reel name_03	14:12:15	14:17:11	04:26	14:12:15	14:17:11	04:26
4	Reel name_04	14:17:11	16:07:06	01:49:25	14:17:11	16:07:06	01:49:25
5	Reel name_05	16:07:06	16:20:16	13:10	16:07:06	16:20:16	13:10

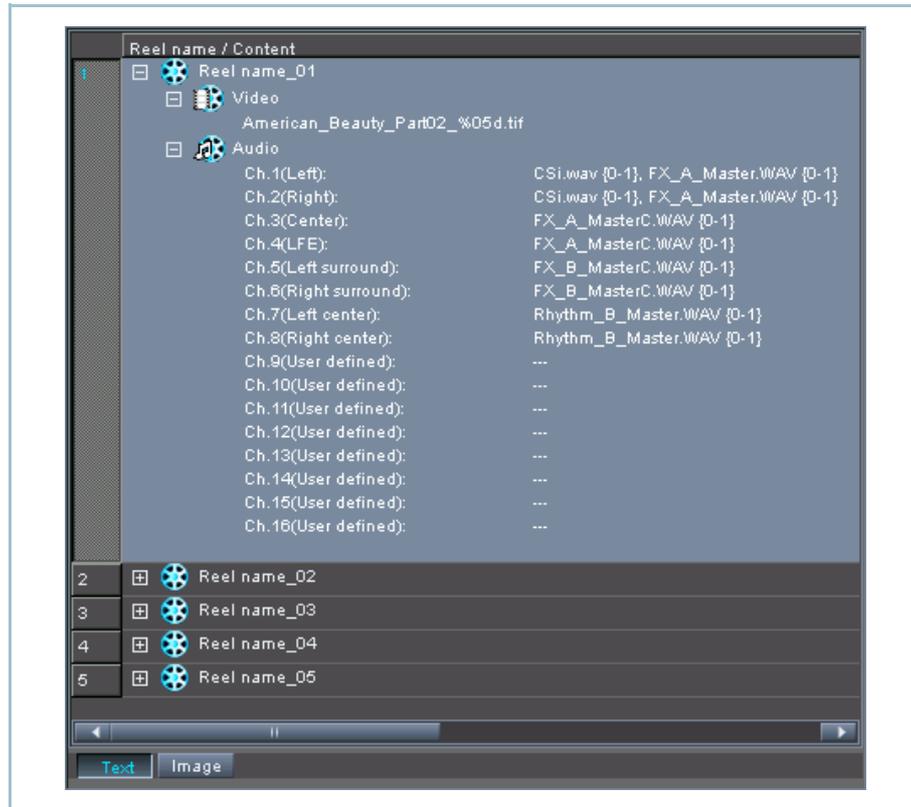
The 'DC reels' tab

The tab **DC reels** shows you the already defined DC reels as they can be seen in the timeline. When selecting a reel, for example, with a click of the mouse, the DVS software will switch to the viewing mode for DC reels (if not already activated) and highlight the respective reel in the timeline. Additionally, the timeline cursor will be positioned at the inpoint of the selected reel.

The entries on this tab provide information about the exact in- and outpoints of the reels as well as their durations. Furthermore, for each reel you can specify an 'action in- and outpoint' (i.e. determine the parameters 'EntryPoint' and 'Duration' of a DCP asset in a CPL). You may use them, for example, if the targeted digital cinema player/server requires something similar to pre- or postroll times. When an action in- or outpoint is specified, the material of this reel that lies outside the action duration will not be displayed by a digital cinema player, only the material of the action duration will be shown during a presentation. An action duration is marked in the timeline area with an orange line below the blue line of a reel, and it will appear as soon as one of the action in-/outpoint is set differently than the in-/outpoint of the reel.

You can change the values of a reel displayed on the tab **DC reels**, i.e. the names of the reels as well as their in-/outpoints, by double-clicking a particular entry with the mouse and entering a new one.

Further information about a reel can be viewed by clicking on the plus/minus (+/-) signs in front of a reel entry. It will expand or collapse the contents of the reel:

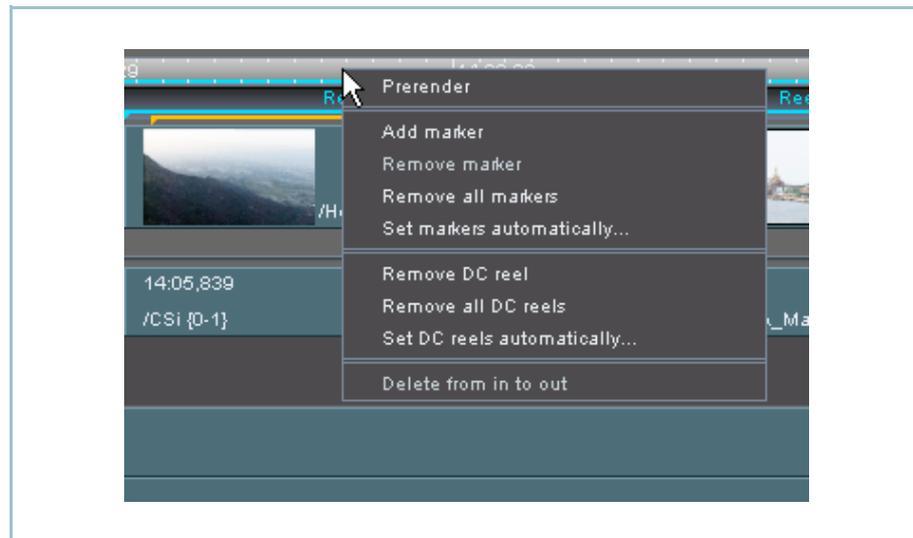


The expanded contents of a reel

With this you can easily confirm the contents of a reel and, furthermore, view the configuration of the audio data (routing of the audio tracks, see also section “Possible Formats for DCI Mastering” on page 363.

### The Context Menu

The context menu of the timeline scale provides some menu options to help you during the configuration and editing of DC reels. Most of them will be available when the DC reels viewing mode is activated.



The context menu of the timeline scale

The following menu options are available to configure and edit DC reels

<b><i>Remove DC reel</i></b>	This menu option removes the DC reel that is currently selected (highlighted) in the timeline area.
<b><i>Remove all DC reels</i></b>	Removes all DC reels defined for the timeline in a single step.
<b><i>Set DC reels automatically...</i></b>	With this menu option you can set reels automatically, see also "Setting Reels Automatically".

## Supplemental DCPs

An already created DCP can be modified, for example, to exchange audio, subtitles or certain parts of video. For this the digital cinema delivery tool provides the option **Supplemental DCP**. It can be used to create different versions of a DCP, for instance, for localizations of a feature film.

A DCP made with the option Supplemental DCP from a master DCP generates anew only the content that was modified. For the unaltered parts of content it still requires and refers to the content of the master. In addition, a supplemental DCP will contain all the extra files that are normally included in a DCP (i.e. CPL, KDMs, PKL, etc.), and thus can be seen as a DCP of its own.

The purpose of a supplemental DCP is to minimize the time and effort to encode different versions of the same package and to reduce its overall size. All cinemas worldwide receive the same international version (master DCP) with identical reels and extra files. Depending on the country a supplemental DCP is provided in addition (normally in a subdirectory of the master DCP) containing only the relevant changes. To load the localized version of the DCP, the extra files of the supplemental DCP have to be used. Whenever necessary they reference to the original material of the master DCP.

This section describes how to use the supplemental DCP feature of the digital cinema delivery tool.

The following topics are covered:

- Preparations (page 392)
- Configuration Steps (page 393)
- Reel Settings (page 393)
- Delivery Creation (page 394)

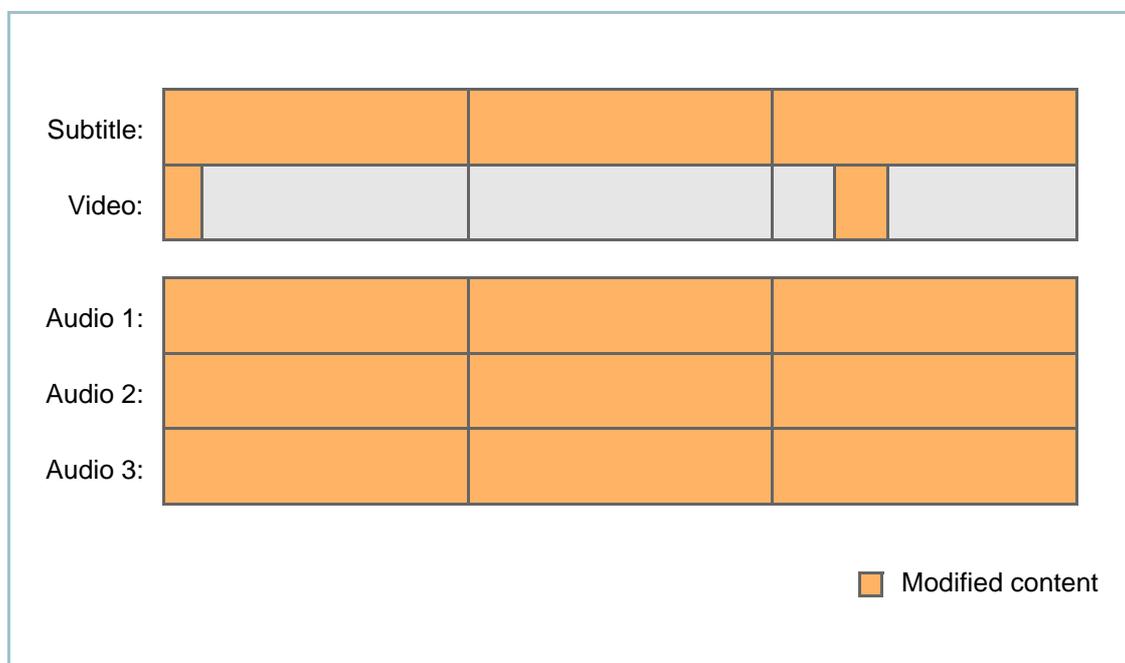
## Preparations

After loading an already generated DCP, it can be modified in the timeline of the Edit Tool. There you can change, for example, the subtitles, certain frames of video and the audio reels.



The track files of a DCP should not be submitted to further rendering processes (e.g. effects on audio or video). For this use the original source project instead.

A loaded DCP can be saved as a project file. This way you can work on an already finished DCP and save your work's progress, e.g. when modifying it.



Example of a timeline with modified content

Afterwards, by using the CLIPSTER with the option **Supplemental DCP** you can create additional supplementing content for this DCP.

## Configuration Steps

The configuration steps that must be performed when creating a supplemental DCP are the same as they were made for the master DCP during its creation. Therefore, to create a supplemental DCP, you can use the CLIPSTER as described in "Digital Cinema Delivery Tool" (page 264). However, because the supplemental content has to be for the most part in the same format as the master DCP, several settings items will already be set and cannot be altered.

## Reel Settings

Same as when generating a full DCP, the option to create a supplemental DCP will deal with the content reel-wise. To comprise only the changed parts of a timeline, it offers you the possibility to use automatically set DC reels for the creation of the additional content, see "Stage 5: CPL" (page 278):



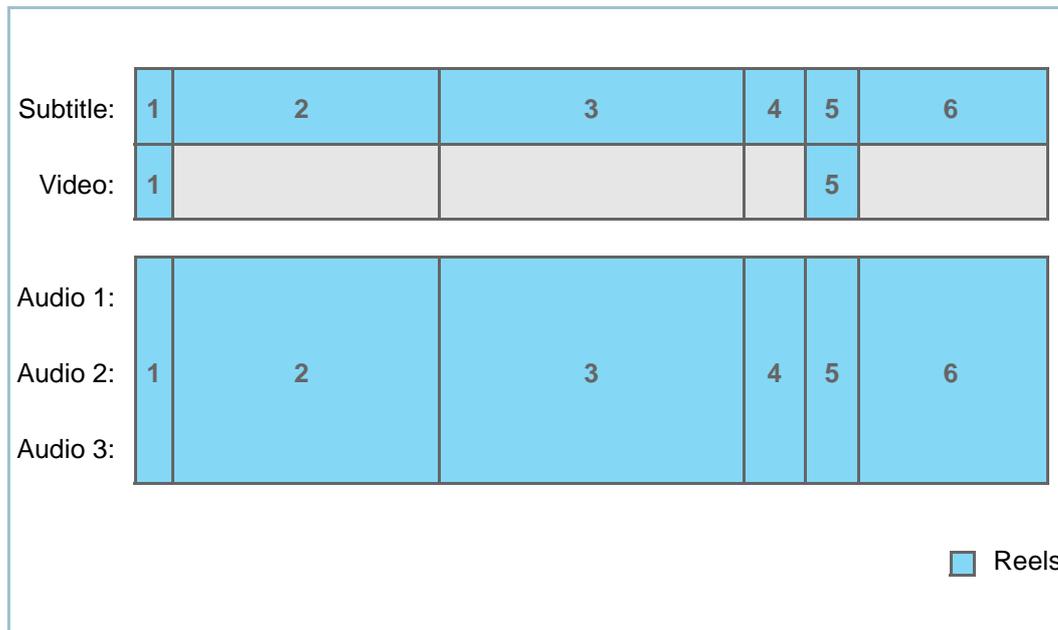
Reel configuration for a supplemental DCP



According to SMPTE a reel must have a duration of at least one second.

Some digital cinema players may be unable to display reels that are shorter than 5 seconds.

The option **Automatically set DC reels...** sets virtual DC reels for the timeline which will include only the changed material. For the example timeline shown in "Preparations" (page 392), this would mean reels like the following:



Reels to be created

The example would create two reels for video and a whole new set of reels for audio and subtitles. The remaining video data (parts in light grey in the figure above) would not be regenerated. During the creation process they can be either copied to the supplemental DCP or left in the master DCP. With the latter the new CPL of the supplemental DCP will reference them. Please note that the total amount of reels increases when using automatically set DC reels.

When using the option **Currently set DC reels**, the reels as currently configured for the DCP in the timeline will be used. If not manually adjusted by you in the meantime, they will be set to the reel settings of the master DCP. By configuring the DC reels in the timeline manually prior to creating a supplemental DCP, you can achieve reels according to your needs.

## Delivery Creation

At the configuration step to specify the delivery creation the CLIPSTER shows you the content that will be created.





## Validating a DCP

The validation tool integrated in the software offers a testing of final DCPs for SMPTE/DCI compliance. You can select from a large list of specified test patterns, also with the possibility to save and load presets of tests. A validation test can be performed either right after the creation of a DCP or on already existing DCPs. It will automatically check against the DCP standard/SMPTE phase that the DCP has been created for. With this you are able not only ensure that a DCP complies with the applying standards, but also if it will be played back on the most common digital cinema players.

The following topics are covered

- Validating a DCP after Creation (page 396)
- Validating an Already Existing DCP (page 396)

### Validating a DCP after Creation

A validation test can be performed right after the creation of a DCP. For this you have to activate in the CLIPSTER on the delivery creation configuration step the check box of the **Validation** settings.



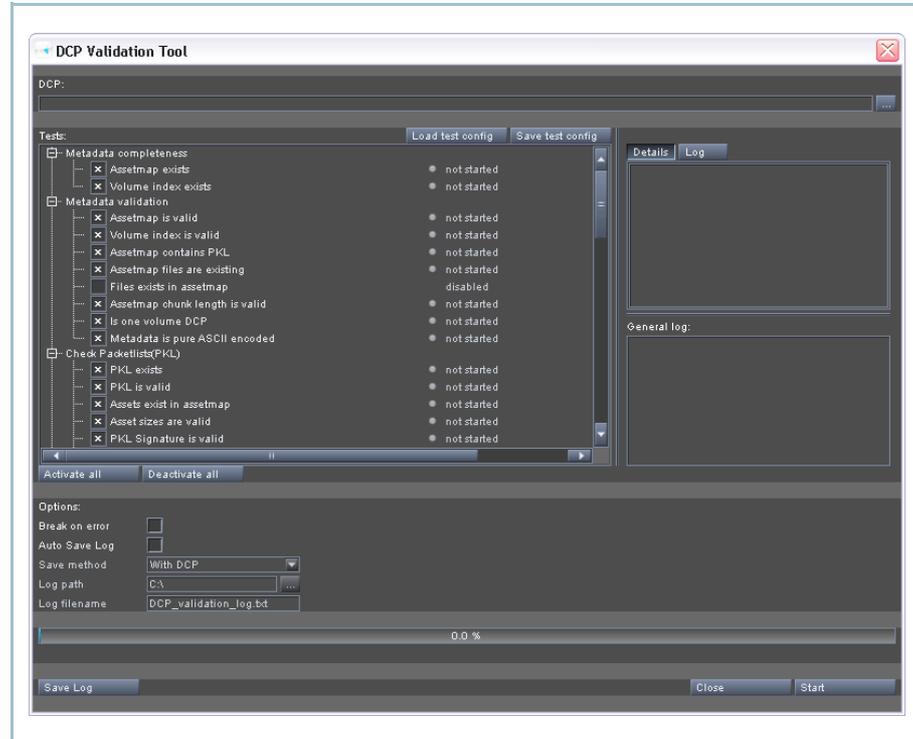
The content that will be created

The validation that will be performed can be set by specifying a validation preset in the entry field (enter its path and file name or browse to it). The preset and/or the test patterns that will be performed can be easily configured with the **EDIT...** button to the right. It opens a window similar to the one when making a validation of an already existing DCP.

### Validating an Already Existing DCP

Validating a DCP is not just reserved for newly created packages but available for already existing DCPs as well. With this you can check the SMPTE/DCI compliance of received packages and, in case of errors, act accordingly, for example, by making a DCP to DCP conversion which often corrects the problems without encoding the essences again.

The option to validate an already existing DCP can be found in **Project » D-Cinema Validation....** It opens the following window:

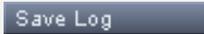


The DCP validation tool

<p><b>DCP</b></p>	<p>Either enter the path to the directory of the DCP that should be validated or use the button to the right to browse to it. In case the DCP to be validated is encrypted, the validation tool automatically searches for the self KDM and loads the keys. If the self KDM cannot be found, you will be asked to specify the matching KDM.</p>
<p><b>Save test config</b></p>	<p>These buttons allow you to load and save presets for the tests that should be performed by the validation tool. Some predefined presets are already available in the installation path of the CLIPSTER software (default: <i>C:\Program Files (x86)\DVS\Clipster\presets\dcivt</i>).</p>

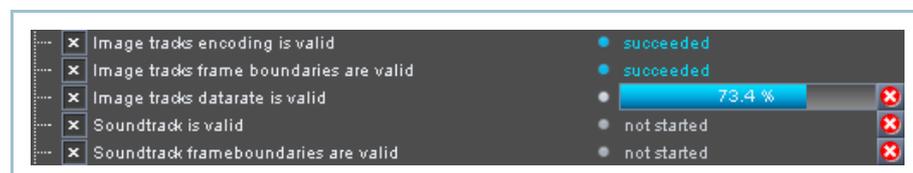


list box	Indicates the individual test patterns that will be or have been performed. Their statuses are stated to the right. By clicking successively on a check box you can set the test to three different states:
	The test will be performed and, if set accordingly, the validation will be halted when an error is found.
	The test will not be performed.
	The test will be performed but it will not cause the validation to be halted when an error is found.
<b>Details</b>	Once a particular test pattern is selected from the list box, this tab offers further information about it.
<b>Log</b>	When a validation has been performed and a test is selected from the list box, this tab gives you further details if a warning or failure has occurred.
<b>General log</b>	In case of a more general error (e.g. if a DCP could not be found), this field provides further information about it.
<b>Activate all</b>	Activates all test patterns in the list box.
<b>Deactivate all</b>	Deactivates all test patterns in the list box.
<b>Break on error</b>	When this check box is activated, the validation will be halted as soon as an error is detected.

<p><b>Auto Save Log</b> <b>Save method</b> <b>Log path</b> <b>Log filename</b></p>	<p>With these items you determine where to save a log file of the validation automatically once a validation is finished. It can be activated with the check box <b>Auto Save Log</b>. Then, when a validation is performed, log file will be saved to the specified location afterwards. When <b>Save method</b> is set to <b>with DCP</b>, it will be saved in the directory where the directory of the DCP is located. With the other settings of <b>Save method</b> you can determine the location yourself. If not specified differently by using the <b>Custom</b> setting, the file name of the log file will normally be the folder name of the DCP.</p>
	<p>With this button you can save the log of the last validation manually.</p>

The validation process can be started by clicking on the button **Start**. Afterwards its progress is indicated by progress bars:

- For the complete validation process below the **Options** settings.
- For individual test patterns in their status indicators.



Progress bar of test pattern

When the validation is finished, the progress bar below the **Options** settings shows 100% and below it the result of the validation is detailed:



Finished validation

In case errors occurred, you can get further information about them on the tab **Log** by selecting the respective test patterns from the list box. When finished with your work, you can close the validation tool with the button **CLOSE**.



## Using the DCP and Self KDM

This section describes the Key Delivery Message feature provided by the R&S DVS system when creating a DCP.

The following topics are covered:

- Understanding Self KDM (page 400)
- Configurations for a Self KDM (page 401)
- Loading the DCP (page 402)
- Loading and Removing Keys (KDMs) (page 404)

### Understanding Self KDM

When a DCP of a feature film is created, it is usually encrypted with the decryption key stored in the KDMs. The decryption key in each KDM is also encrypted, and it can be decrypted only with the private key of the respective D-Cinema player/server for whom it was created. The conclusion of this is that, once an encrypted DCP is created, it cannot be modified or checked for flaws that may have occurred during the encoding and/or wrapping processes. The DCP together with a KDM and all other extra files are self-contained, intended only for a specific usage in a defined period of time on a particular device.

R&S DVS solution to this problem is the self KDM that will be created together with the other KDMs. It has to be generated with the public key of a R&S DVS DCI Mastering system, which can be either the one used to create the DCP or any other one (e.g. another CLIPSTER DCI Mastering system). This DCI Mastering system can then be used to load the DCP. Although the self KDM carries a validity same as the other KDMs, with the DCI Mastering system you will be able to use the content nonetheless even if the validity has expired.

Once a DCP is loaded with the self KDM, you can, for example, play it out and check its content, create other KDMs (e.g. for later releases) or modify it (e.g. exchange audio). Additional rendering/encoding processes will only be performed where alterations were made, i.e. the DCP will not be generated again completely.



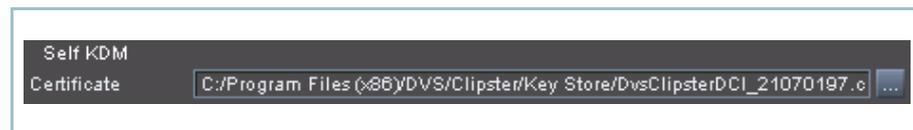
DCPs can also be created unencrypted, for example, for trailers or advertisements. Then, of course, they do not require KDMs or a self KDM. Unencrypted DCPs as well can be used as described in this section, but do not require a self KDM.

## Configurations for a Self KDM

For the creation of a DCP you have to make some general settings on the tab **Defaults** of the Configuration Tool of the software and set, for example, the private key to sign the extra files of the DCP (i.e. CPL, KDMs and PKL).



In the field **CERTIFICATE** of the area Self KDM you have to enter the path to the file (**\*.cer** or **\*.pem**) that holds the public key of the R&S DVS DCI Mastering system where the DCP should be loaded.



Setting the public key for a self KDM

This public key file can be found either already stored in the installation directory of the software on the respective system or on a separate portable storage device.

Because the settings on the **Defaults** tab are general settings of the software, they will be set and available for each initialized new project. This way you do not have to configure the path and file name of the public key file of the respective system again when creating other DCPs in the future.



This setting to create a self KDM is available for convenience reason because you have to set it only once. Anyway, a self KDM is just another KDM, only that it is made for a DVS CLIPSTER system. If wanted, you may create a self KDM the same way as any other KDM.



Once this setting is made, the self KDM will be created during the generation of the DCP. It will be stored at the same location as the other files of the DCP (normally with the file name *KDM\_self\_\*.xml*). This file will then be used when loading the encrypted DCP on the DVS system for which it has been created, for example, for quality check.



For an even easier handling of encrypted DCPs at the creator's site there is also the KeyStore feature available, see "The Keystore" on page 406.

## Loading the DCP

After a DCP has been created it can be loaded with the DVS software. Unencrypted DCPs can be loaded on every DVS system that provides the CLIPSTER feature. Encrypted DCPs, however, require a self KDM and can be loaded only on the system for which the self KDM has been intended, i.e. on the CLIPSTER system that holds the complementary key (private RSA key) to the public key that was entered in the Configuration Tool



For an even easier loading of an encrypted DCP there is also the KeyStore feature available, see "The Keystore" on page 406.

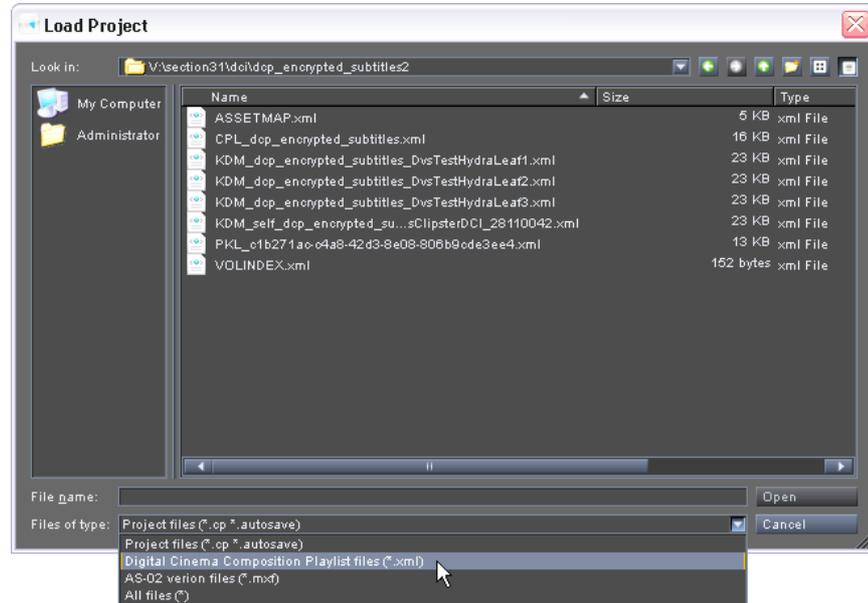
Perform the following steps:



When loading a DCP, the DCP standard configured for the system (see "DCP Standards" (page 365)) should be set to the same that the DCP was created in. Otherwise you may receive error messages.

1. In the software open the dialog window to load a project (**Project » Open...**).
2. Switch to the directory where the DCP or, more explicitly, the CPL is stored.

3. Select as the file type to be displayed in the 'Load Project' window the setting Digital Cinema Composition Playlist files (combo box **Files of type**).



- ▶ The extra files of the DCP (in \*.xml format) will be displayed in the dialog window.
4. Select the CPL of the DCP that you want to load and open it with the DVS software by clicking the button **OPEN**.
    - ▶ This will check the CPL if the DCP contains encrypted content. When this is the case, the DVS software will search for an appropriate KDM for the DCP (i.e. the self KDM) in the directory level of the extra files of the DCP. If none can be found, a dialog window for the selection of a file will appear, asking you for the location of the file. Once the KDM has been found and/or loaded, the content of the DCP will be opened in the Edit Tool and you will see it in the timeline.



A DCP can also be loaded via the menu option **Project » Insert Project...** This way you can load several encrypted/unencrypted DCPs and their assets in one project. Then, once the timeline is assembled, a new DCP can be created easily, thereby merging the individual CPLs to one.

A loaded DCP is not a DVS project file. Therefore, certain settings may not be configured correctly and you may have to set them again.

A loaded DCP can be saved as a project file. This way you can work on an already finished DCP and save your work's progress, e.g. when modifying it



If you want to view the DCP on an XYZ projector, you have to deactivate the automatic color conversion from X'Y'Z' to RGB of the DVS software. For this you have to alter the color spaces of the clips in the bin of the Edit Tool and set them to RGB.

For a playout of JPEG2000 material in X'Y'Z' with CLIPSTER you can configure the RGB output (incl. gamma) via the Configuration Tool (menu **Options » Configuration defaults... » group JPEG2000 Compression**).

Now you can use the DCP, for example, to play out the timeline and review the content of the DCP for quality checks.

## Loading and Removing Keys (KDMs)

When working on other projects on a R&S DVS DCI Mastering system, you may want to add parts of video or audio from already created DCPs. While unencrypted DCP track files can be added without further ado, for encrypted material you have to provide the key to decrypt the material.

The menu option **Load KDM...** allows you to load the keys of a self KDM into the memory of the DCI Mastering system. Afterwards the encrypted clips can be added to the bin and you can use them in your project.

The self KDM must have been created for the DVS system where you are working on (see also "Configurations for a Self KDM" (page 401)).

The number of keys that can be loaded at a time is limited. A single KDM usually contains several keys (one for each track file) and up to 256 different keys can be loaded.



The self KDM must have been created for the DVS system where you are working on.

The number of keys that can be loaded at a time is limited. A single KDM usually contains several keys (one for each track file) and up to 256 different keys can be loaded.

Perform the following steps:

1. On the Project menu select the menu option **Load KDM....**
  - ▶ This will open the dialog window to open a file.
2. In this window select the self KDM generated for the DCP from which the track files should be used and confirm your selection with the button **OPEN.**
  - ▶ This will load the keys of the self KDM into the CLIPSTER system.
3. Add the wanted track files (video, audio and/or subtitles) to the bin either by using a file manager or the menu option **Add clip...** of the bin's context menu.
  - ▶ This will make the encrypted track files available in the software and you can use them in your project.



You can also work the other way around: First load the encrypted track files and then the self KDM.

When using this function, encrypted material may sometimes provide no thumbnails or waveforms in the software. However, the material is decrypted and can be used as usual (e.g. video can be seen in the overlay).

By using the menu option **Remove KDMs from memory** on the menu **Project** you can delete the keys from the memory of the CLIPSTER system. Afterwards, if still available in your project, the track files will be encrypted again.



## The Keystore

This section describes the KeyStore feature available for CLIPSTER systems. It makes the handling of encrypted DCPs easier at the creator's site.

The following topics are covered:

- Understanding the KeyStore Feature (page 406)
- Creating a KeyStore Network Certificate (page 408)
- Installing the KeyStore Network Certificate (page 411)

### Understanding the KeyStore Feature

If you want to view or modify an encrypted DCP, e.g. for quality checks or different language versions, a KDM for the system where to view/modify the DCP must be created and delivered along with the DCP. DVS offered some ease of this issue via the self KDMs. The KeyStore feature makes the viewing or modification of DCPs at the creator's site even easier.

#### General Functionality

For all DVS DCI Mastering systems the general functionality of the KeyStore feature will be available. Instead of just creating a self KDM to enable you to view or modify DCP content, it will also store all necessary information of the self KDM in a database. If the self KDM was intended for the same DCI Mastering system that also created the DCP, you will be able to add single DCP track files of an encrypted DCP to the bin and timeline without having to specify the self KDM in an additional step.

The self KDM as a file, however, will still be created the usual way. This ensures that, if the self KDM was intended for another DCI Mastering system (i.e. not the one that created the DCP), it can be used on such a system same as before.

#### Network-based KeyStore Feature

An even greater benefit of the KeyStore feature is that its database can be accessed by other DVS CLIPSTER systems via the Spycer network (SpycerNet). When a special certificate (KeyStore network certificate) is installed, encrypted DCPs or DCP track files can be decrypted on every CLIPSTER system where the certificate is installed as long as the system is in the same domain (optional) and SpycerNet group (mandatory).

On the DCI Mastering system that creates the DCP, instead of encrypting the AES keys of the track files with the hardware related certificate for the self KDM, they are encrypted with the public key of the KeyStore network certificate. The encrypted AES keys are then stored in the database and can afterwards be accessed by requesting systems via the SpycerNet. During transfer over the network the keys will remain encrypted. After receiving, the requesting system will be able to decrypt the information if it has the private key of the KeyStore network certificate installed. Then the decrypted AES keys of the DCP or track file will be handed over to the hardware that performs the final AES decryption of the content.

On all systems that should be part of the network-based KeyStore feature the KeyStore network certificate has to be installed.

### Availability and Usage

The general functionality of the KeyStore feature is enabled and available on all CLIPSTER systems.

The network-based KeyStore feature on the other hand requires at least Windows 7 and the installation of the KeyStore network certificate. Once it is installed, the networking of the KeyStore database can be controlled with the check box Use KeyStore Certificate of the group DCI of the Configuration Tool. When activated, the database will be available for accesses via the SpycerNet; when deactivated, a networking is prohibited.

Please observe the following important notes

- To use the network-based KeyStore feature, Windows 7 or higher must be installed on every participating DCI Mastering system. On other versions of the Windows operating system the network-based KeyStore feature will be disabled automatically. The general functionality of the KeyStore feature is available on all versions of Windows.
- The KeyStore network certificate allows a CLIPSTER system in a network to decrypt encrypted DCP content if the certificate is installed on this system.
- The KeyStore network certificate is managed by the Windows operating system in a certificate store and not kept in hardware. This does not comply with a trusted environment as specified by SMPTE or DCI.
- R&S DVS cannot be held responsible for security issues resulting from the use of the KeyStore feature or the KeyStore network certificate such as possible data leaks or loss of data.



- The system's administrator should be aware of how the Windows certificate store works and must keep the certificate password at a safe place protected from unauthorized access.

## Creating a KeyStore Network Certificate

The KeyStore feature allows CLIPSTER systems to exchange encrypted DCPs over a network without the need to create system-specific KDMs. This feature requires the installation of a unique and special KeyStore network certificate (RSA public and private key pair) on all systems that should use the network-based KeyStore feature.

### NOTICE

#### Security

**It is strongly recommended to hand over the certificate creation to a trusted system administrator familiar with certificates.**

Perform the following steps:

1. If not already the case, install OpenSSL ([www.openssl.org](http://www.openssl.org), for the Windows binaries see [www.openssl.org/related/binaries.html](http://www.openssl.org/related/binaries.html)).
2. Download and install e.g. 'Win32 OpenSSL v1.0.1c Light' or higher. By default the installation path is `C:\OpenSSL-Win32`.
3. Open the Windows command prompt and create an empty writeable directory within the `bin` directory of OpenSSL.
4. Switch/change into this directory.
  - ▶ Before starting you will have to set the environment for the OpenSSL configuration file.
5. In the command line type in  
`set OPENSSL_CONF=C:\OpenSSL-Win32\bin\openssl.cfg`  
and press [Enter]
  - ▶ Now, you can create an RSA certificate with a public and private key pair.

**NOTICE**

**Expiration Date**

After expiration the encrypted information stored in the KeyStore database cannot be decrypted anymore.

**Please observe the `-days` parameter. It sets the expiration date of the certificate.**

6. With the following command the certificate will expire in approx. 100 years:  

```
.\openssl.exe req -x509 -nodes -days 36500 -newkey "rsa:2048" -keyout keystore.pem -out keystore.pem
```

  - ▶ You will be asked for some information
7. Answer the requested information as shown in the following example. In case you want to answer with empty/nothing, enter a dot.

Country name (2-letter code)	US
State or province name (full name)	MyState
Locality name (e.g. city)	MyCity
Organization name (e.g. company)	MyCompany
Organizational unit name (see above)	#KSD=MyDomain
Common name	KeyStore
E-mail address	.

8. Now convert the certificate to a PFX file. Type in:  

```
..\openssl pkcs12 -export -out keystore.pfx -in keystore.pem -name "KeyStore"
```

 and press [Enter].
9. Extract the public key to a CER file. Type in:  

```
..\openssl pkcs12 -in keystore.pfx -out keystore.crt -nokeys -clcerts
```

 and press [Enter]. During this you have to enter the password specified in the previous step.



**10.** Then enter

```
..\openssl x509 -inform pem -in keystore.crt  
-outform der -out keystore.cer  
and press [Enter].
```

- ▶ With this you have created the PFX and CER files, i.e. the RSA private and public keys. You now have to finish the certificate creation by performing the following:

**11.** Delete all temporary files created during this process except the *keystore.pfx* and *keystore.cer* files and memorize the password or keep it at a safe place but never together with these files.

After this the creation of the KeyStore network certificate (RSA public and private key pair) is finished. In essence you can find in the CER file the public key, while the password encrypted PFX file contains the private key.

For the step to install the certificate on one or more DCI Mastering systems the two files should be stored in a safe way on a removable media. They are required for each system that should use the KeyStore feature.

## Installing the KeyStore Network Certificate

Once the KeyStore network certificate is available, you can install it on a CLIPSTER systems. It must be installed on every CLIPSTER system that should use the KeyStore feature, regardless whether they create DCP content or decrypt it. Furthermore, the systems must be in the same domain (optional, depending on the setting of the field 'OU', see "Creating a KeyStore Network Certificate" (page 408)) and they must be in the same SpycerNet group (mandatory). Both keys, the private and the public key, have to be installed

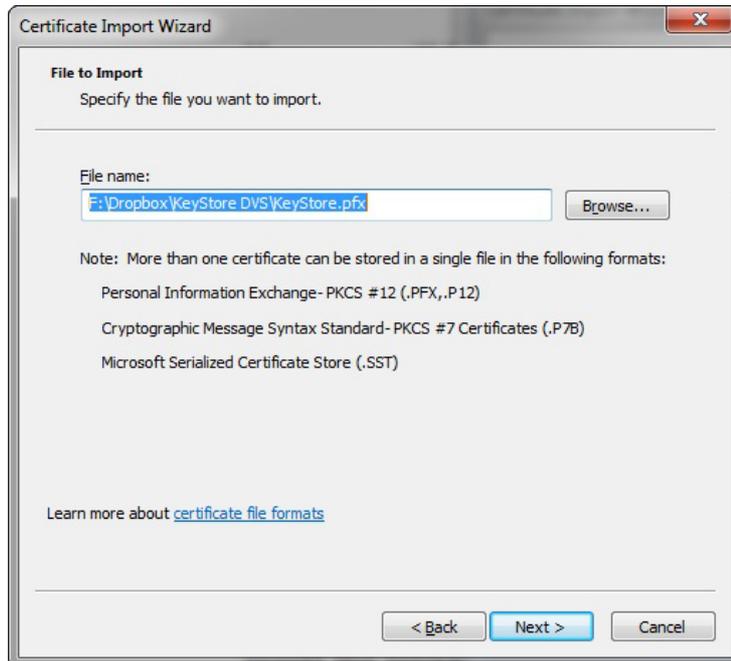
### Installing the Private Key on a DCI Mastering System

Perform the following steps:

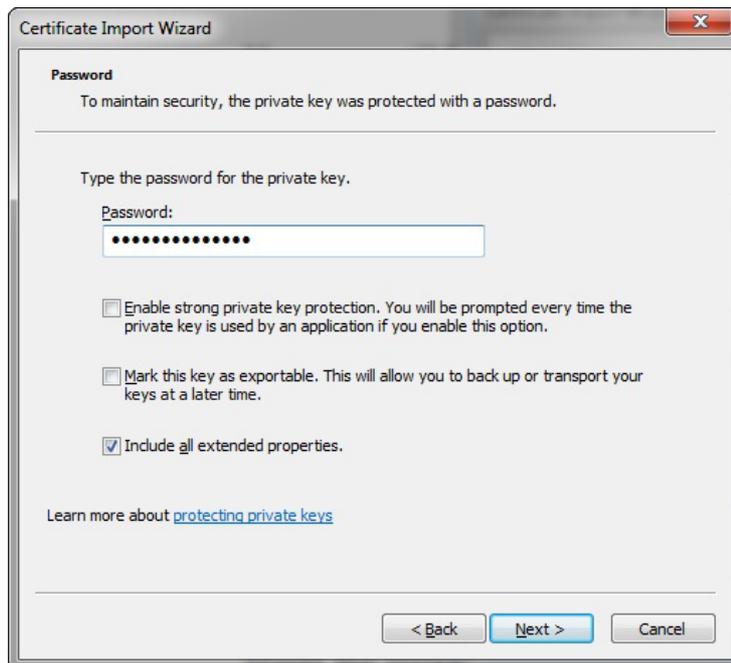
1. At the DCI Mastering system that should be able to use the KeyStore feature insert the removable media with the **keystore.pfx** file.
2. Open the file explorer, browse to the location of the file and execute the **keystore.pfx** file.
  - ▶ This will automatically start the certificate import wizard. By stepping through the wizard as explained below you will install the KeyStore network certificate in the Windows certificate store:



3. Click on the button **NEXT**



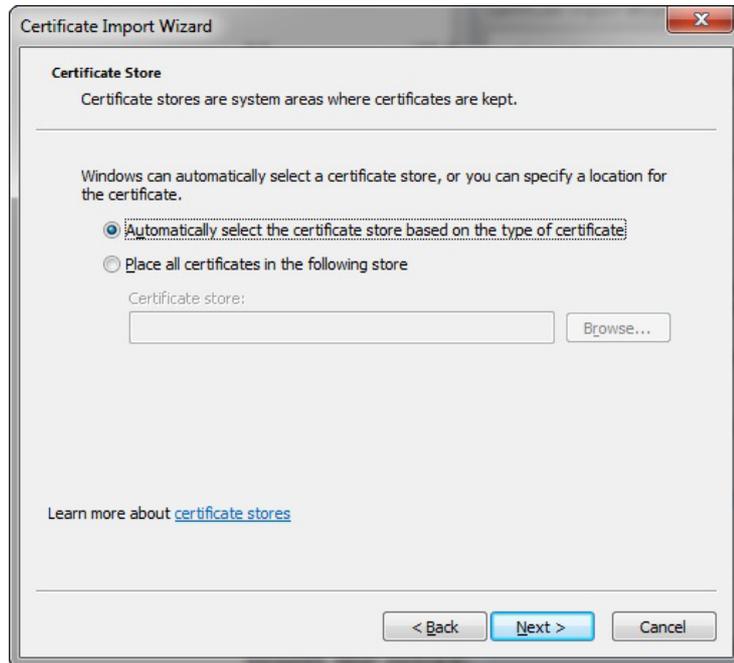
4. Click on the button **NEXT**



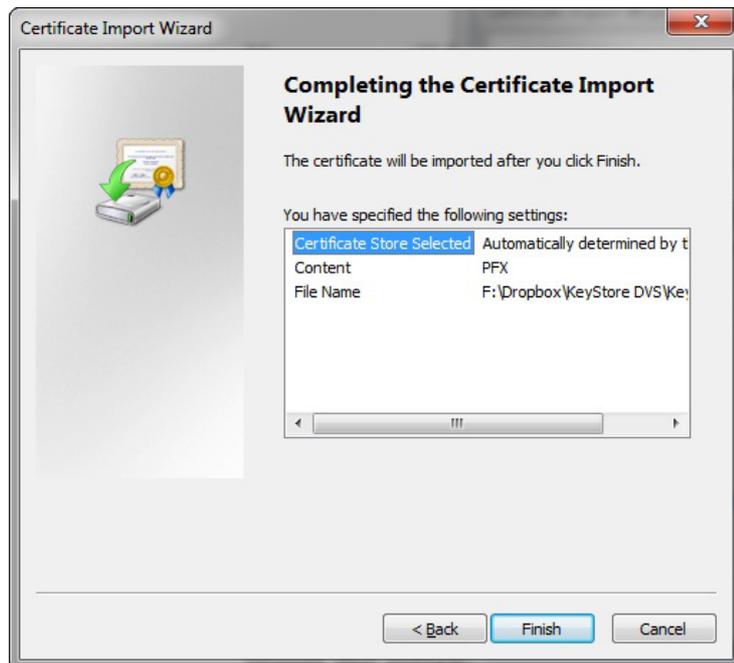
5. Enter the password for the certificate.

6. Deactivate the check boxes **Enable strong private key protection...** and **Mark this key as exportable...** (last check box **Include all extended properties** should be enabled).

7. Click on the button **NEXT**



8. Click on the button **NEXT**



9. Click on the button **FINISH**.

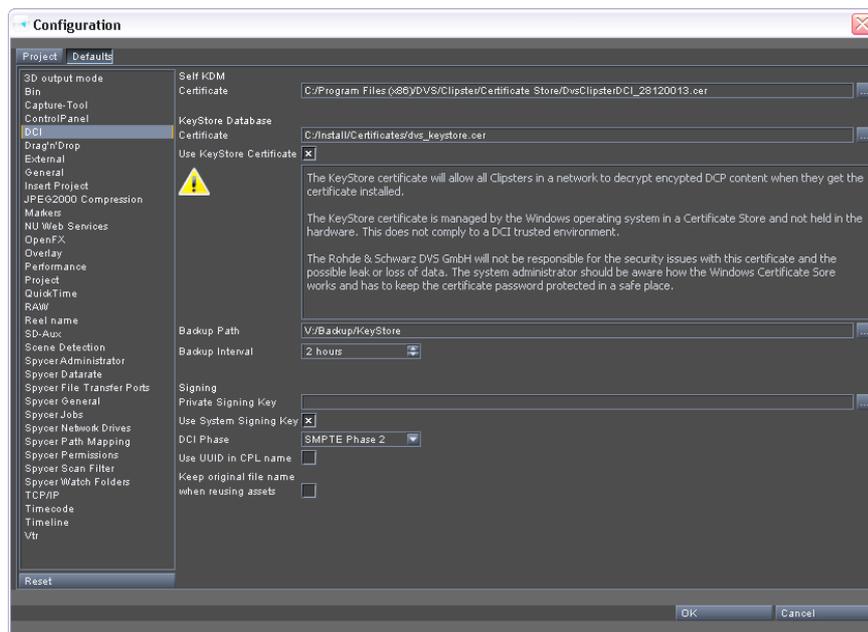
The certificate is now installed in the Windows certificate store. You can verify this with the Windows program *certmgr.msc*. The KeyStore network certificate can be found in the folder **Personal**.



## Installing the Public Key on a DCI Mastering System

Perform the following steps:

1. At the DCI Mastering system that should be able to use the KeyStore feature copy the `keystore.cer` file to a location of your choice on the local storage. No security issues have to be regarded here because the file contains the public key of the certificate only.
2. Start the software and click on the **CONFIG...** button at the bottom to open the Configuration Tool.
3. Switch to the tab **Defaults** and select the group **DCI**.



4. Set the path **Certificate** under **KeyStore Database** to the locally stored `keystore.cer` file and activate the check box **Use KeyStore Certificate**.
  - ▶ If everything is fine the check box will remain enabled and the KeyStore feature will be ready to use.



Use the items **Backup Path** and **Backup Interval** to determine where and how often to create a backup of the KeyStore database.

5. As a last step, if not already done, configure the SpycerNet groups in the group **Spycer Administrator** of the Configuration Tool. For further information about this see the "Spycer" user guide. All systems exchanging information for the KeyStore feature must be in the same SpycerNet group.



After confirming the settings in the Configuration Tool the procedure of installing the private and public key of the KeyStore network certificate is finished. The respective DCI Mastering system should then be ready to create DCP content or decrypt it when coming from another DCI Mastering system within the same SpycerNet group and, if applicable, domain.

In case other R&S DVS DCI Mastering systems should also be able to create or decrypt DCPs using the KeyStore feature, you have to repeat the steps to install the KeyStore network certificate on each of them.



## User-prepared Certification File

There are two ways to add trusted devices such as projectors to a player/server certificate in the **Recipient certifications** for the KDM file:

- 1 You can drag and drop the projector certificates from a file manager to the respective player certificate already present in the list box of the **Recipient certifications**.
- 2 You can add a user-prepared certification file to the **Recipient certifications**.

The user-prepared certification file is a standard text file with the following syntax:

```
## DVS TDL file ##

-----RECIPIENT CERTIFICATE-----:

-----BEGIN CERTIFICATE-----
<certificate of player/server>
-----END CERTIFICATE-----

-----TDL CERTIFICATES-----:

-----BEGIN CERTIFICATE-----
<certificate of projector 1>
-----END CERTIFICATE-----

-----BEGIN CERTIFICATE-----
<certificate of projector 2>
-----END CERTIFICATE-----

...
```

TDL stands for 'Trusted Device List'. Simply copy the respective certificates from the certificate files of the devices and replace their place holders in the syntax above (i.e. <certificate of ...>).

Once the text file has been saved with, for example, the file extension *\*.pem*, it can then be added to the **Recipient certifications**.

## Keys and Certificates Explained

There are various keys and certificates involved in the process of creating a DCP. This section tries to shed some light on them and the way they are used.

The following topics are covered:

- Understanding a Key (page 417)
- Understanding a Certificate (page 418)
- The Key Players of the DCI Mastering (page 418)
- The Keys Applied (page 421)
- Understanding the Certificate Chain (page 424)

### Understanding a Key

A key is a piece of information (normally a string) that determines the output of a cryptographic algorithm. The key is used during encryption by the cryptographic algorithm to transform a certain piece of information (e.g. plaintext) to ciphertext, i.e. encrypted information. Vice versa, during decryption the key is used by the algorithm to decode the ciphertext back to the original information.

There are two types of keys available:

symmetric	If the algorithm uses the same key during encryption and decryption, it is known as a symmetric key algorithm.
asymmetric	Algorithms that require two different keys, one for encryption and one for decryption, are called asymmetric key algorithms. The concept behind them is that it is almost impossible to compute one key from the other. With this you can make one key public (the public key) while keeping the other in secret (the private key), thus providing others with the means, for example, to send encrypted pieces of information to the private key holder that only he can decode.



## Understanding a Certificate

A certificate is a file that usually contains a key. Additionally it includes a digital signature to ensure the validity of the key/certificate. With this the purpose of a certificate is, on the one hand, to provide you with a key and, on the other, to confirm that this certificate and key belong to a certain identity (e.g. a person, institute or company).

Ideally the signature comes from a certificate authority (CA) charged with the task of checking identities before issuing certificates that refer to this identity. However, the most commonly used certificates are those that users make for themselves (self-signed certificates). Also common are certificates that users make for others so that these can certify validities on behalf of the user.

In CLIPSTER a certificate normally contains a public key (\*.cer or \*.pem files). A private key is usually provided in a personal information exchange file (\*.pfx) which is typically encrypted and requires a password to be opened. This file will also contain the public key certificate (or more than one if a certificate chain is involved) for authentication as well. Thus, a PFX file contains besides the private key one or more public keys.

## The Key Players of the DCI Mastering

Detailed in the following you can find the key pairs that are used during mastering.

### AES Key

The AES key is a symmetric key used to en- and decrypt the content of the DCP (track files). For each track file an individual AES key is generated. This key will be encrypted with the Encryption Key on CLIPSTER (see below) and written to the KDM file.

The AES key is generated randomly and automatically by CLIPSTER.

### Encryption Key

The Encryption Key is an asymmetric key pair (RSA) used to encrypt and decrypt the AES key. Typically this key pair is generated by the manufacturer of the D-Cinema player and handed to the purchaser of the player:

- The **public key** of the Encryption Key is used to encrypt the AES key when it is written to the KDM. Usually it is embedded in a certificate file.

- The **private key** of the Encryption Key is stored on the D-Cinema server/player at the recipient's site. It is used to decrypt the AES key provided via the KDM.

The private key is stored at the recipient's site and will not be distributed. Thus it can be disregarded because it will not be available to you.

The public key should have been sent to you in a signed certificate to enable you to create a DCP for this player. It has to be set on CLIPSTER.

**Signing Key** The Signing Key is an asymmetric key pair (RSA) used to sign and validate the files of a DCP (e.g. KDM or CPL). With it the creator of the DCP digitally signs the extra files, while the recipient will be able to verify that the DCP was distributed by the creator/distributor and not altered in the meantime:

- The **private key** of the Signing Key is used to create a signature for the files of a DCP, i.e. it is used to encrypt hash values of the files.
- The **public key** of the Signing Key will be part of a certificate that will be attached to the extra files (if required, the certificate chain will be attached).

The private key has to be set on CLIPSTER. Normally, it is stored encrypted in a PFX file and will require a password to be opened. The creator of a DCP has to provide this key (i.e. his own Signing Key).



The most appropriate way to receive a Signing Key is to order it from a certificate authority (CA). However, you can find included in the delivery of the DCI Mastering feature a tool that can be used to create a Signing Key (i.e. a self-signed certificate).

Alternatively, you can use a system specific (unique) Signing Key that R&S DVS generates for each CLIPSTER system. It can be used instead of your own key if you are sure that it meets the safety requirements of your distribution chain.



R&S DVS grants you usage of this Signing Key under the provision that you shall be directly and exclusively liable for its application.



The public key of the Signing Key will be attached to the extra files of the DCP via certificates. Thus, it will be distributed with them to the D-Cinema player automatically. There the exhibitor can extract it from the files and use it to verify the origin and validity of the DCP.

**Self KDM Key**

This key is not necessarily required. A DCP can be created without it, but afterwards it would be impossible to load it again with a DVS DCI Mastering system.

The key for a self KDM is in most respects identical to an Encryption Key. While the private key is stored securely in the hardware of the respective DVS DCI Mastering system, the complementary public key is provided via a certificate file. You can find this file either already stored in the installation directory of the DVS software on the respective system or on a separate CD-ROM. However, compared to the Encryption Key this key has to be set differently in the software.



Further information about a self KDM and where it can be set in the DVS software can be found in "Using the DCP and Self KDM" (page 400).

**Summary**

The following lists shortly the most important points about the different key:

<b>AES key</b>	Generated automatically by <b>CLIPSTER</b> .
<b>Encryption Key</b>	Certificate with public key must have been sent to you by the theater (i.e. the public key of a specific D-Cinema player) Has to be set on <b>CLIPSTER</b> .

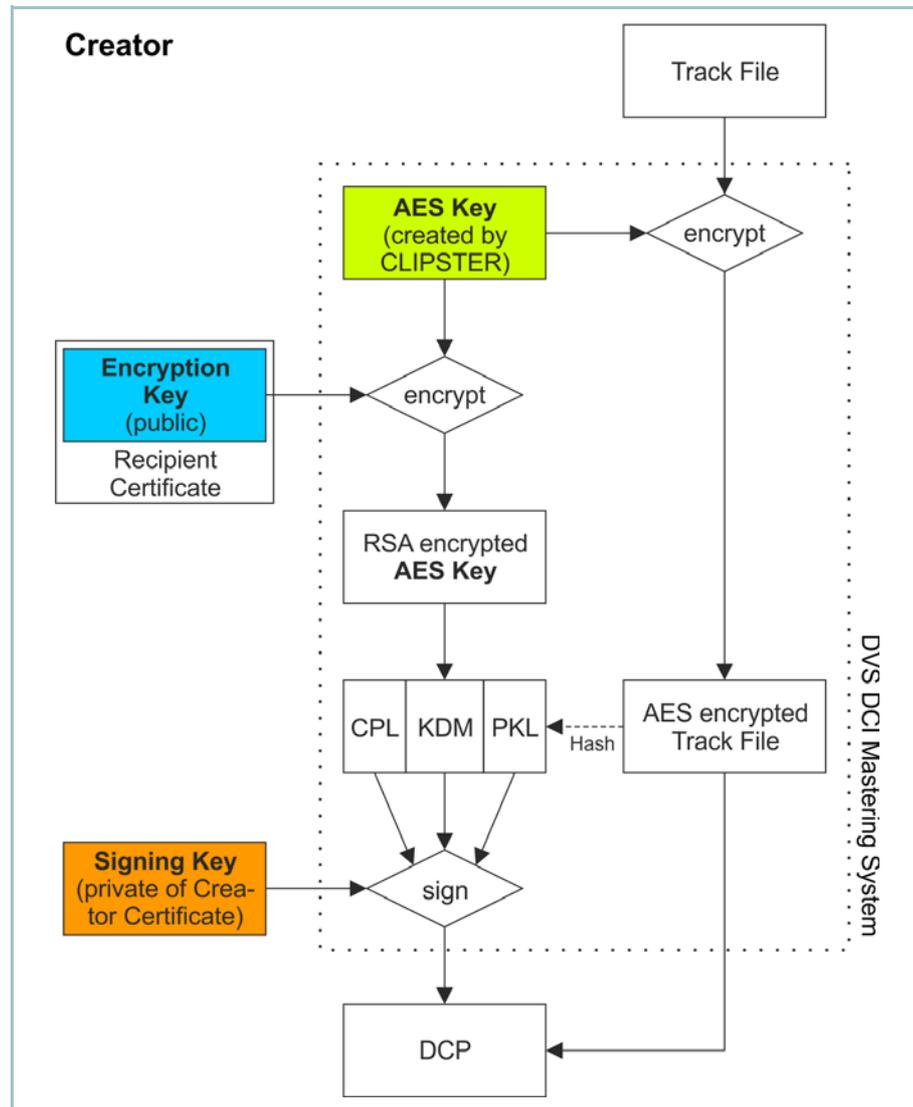


<b>Signing Key</b>	<p>Normally, you must provide this key pair (i.e. your own Signing Key) and its private key has to be set on <b>CLIPSTER</b>.</p> <p>Alternatively, you may use a system specific Signing Key provided by DVS if it meets your safety requirements.</p> <p>The public key of the Signing Key will be attached to the extra files of the DCP and is thus delivered with the DCP automatically.</p>
<b>Self KDM</b>	<ul style="list-style-type: none"><li>– Similar to the Encryption Key</li><li>– Public key file is available in the installation directory of the respective R&amp;S system.</li><li>– Requires a different setting than the Encryption Key in the software</li></ul>

## The Keys Applied

The following shows in diagrams the keys as they are applied during a DCI Mastering on CLIPSTER and a payout by the D-Cinema players:

**The Keys on CLIPSTER** This diagram shows the keys applied on a R&S DVS DCI Mastering system:

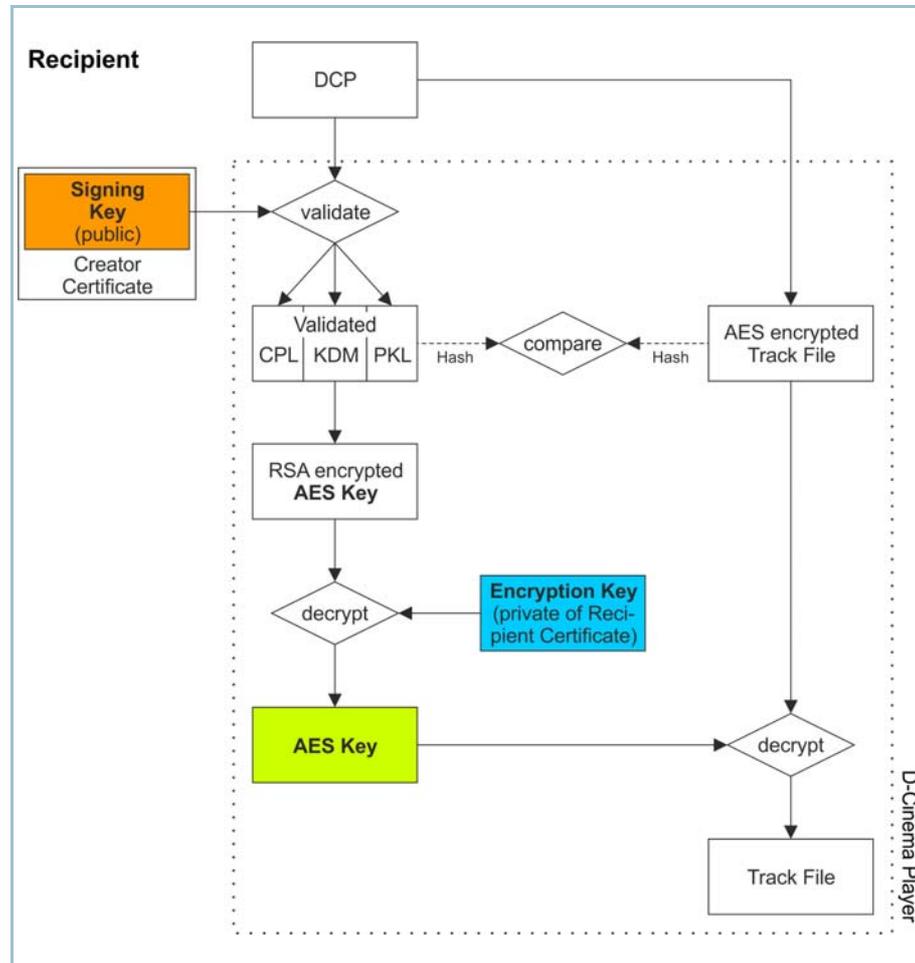


The keys and where they are used on the Creator side

The generated track file of the DCP is encrypted with an AES key that has been randomly generated by the DVS system. For each track file one AES key will be created and used. The AES keys are then encrypted with the public key of the Encryption Key. Afterwards the encrypted AES keys are written to the KDM file. Of each encrypted track file a hash value is created which is then written to the PKL file. Next, the completed CPL, KDM and PKL are signed with the Signing Key. The finished DCP can then be sent to the Recipient.

**The Keys at the Recipient**

This diagram shows the keys as they are applied at the Recipient's site:



The keys and where they are used on the Recipient side

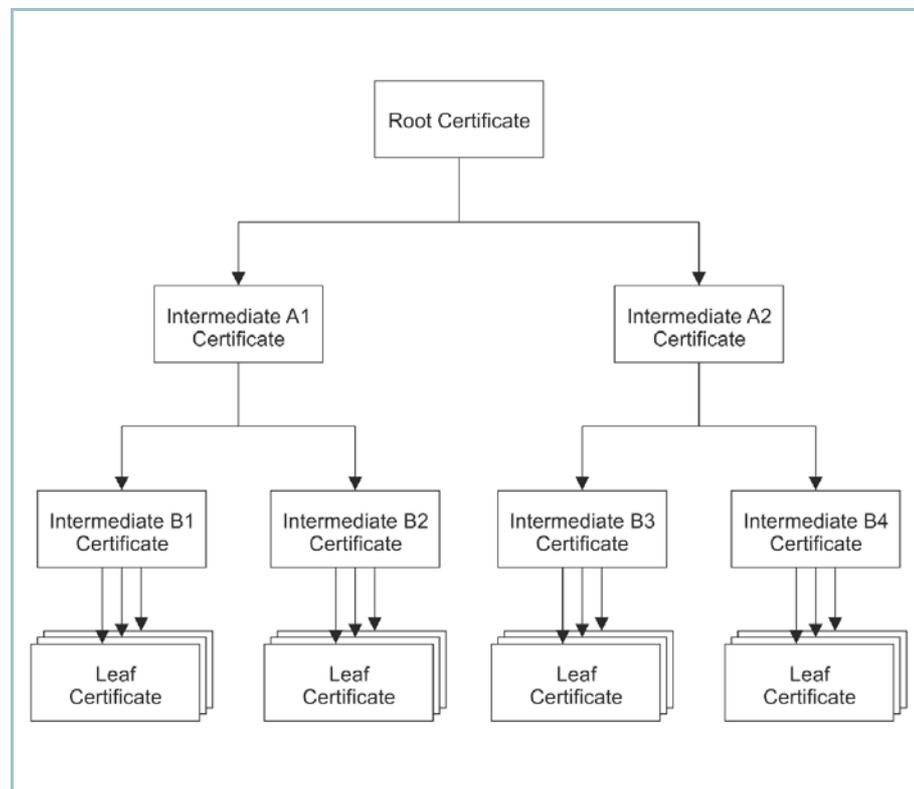
At the Recipient the received DCP has to be validated with the help of the public Signing Key that is attached to each extra file of the DCP (e.g. CPL, KDM or PKL). Whether the track files were received unmodified can be checked by comparing the hash values written in the validated (and thus unaltered) PKL file with hashes calculated from the received track files. The completely validated DCP can then be played out by decrypting the AES keys with the private key of the Encryption key. After this the AES keys will be used to decrypt the track files of the DCP.



## Understanding the Certificate Chain

Certificates can be distributed in a chain, where the last certificate (the leaf certificate that cannot create other certificates) certifies that it comes from another certificate (the intermediate certificate), this certifying that it comes from a further certificate (another intermediate), and so on until the last certificate in the chain is reached (the root certificate that confirms the validity of the whole chain as well as the identity of its issuer).

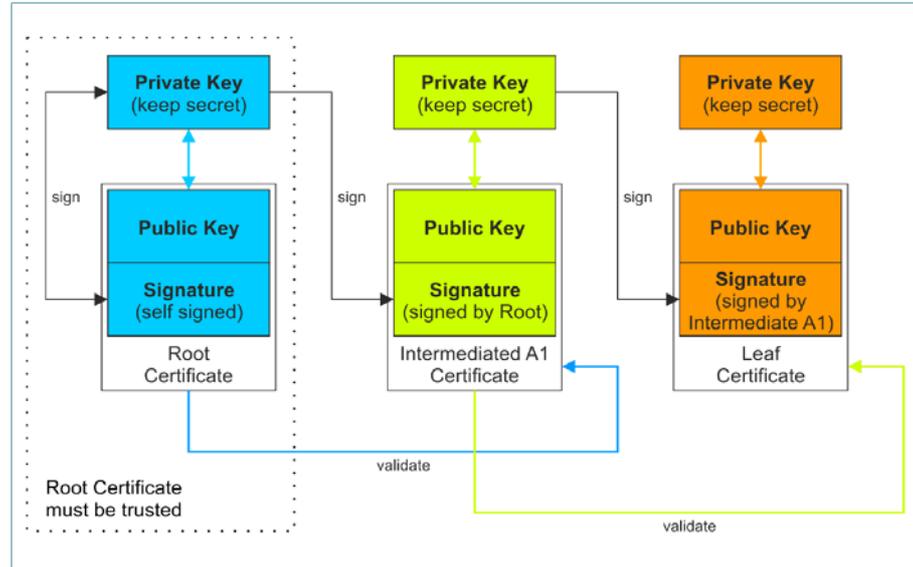
The whole structure of a certificate chain implies a hierarchy where the highest rank is held by the root and the lowest by the leaves.



Certificate hierarchy

A root certificate is either a CA-issued certificate or a self-signed one, i.e. it is signed by its own private key. From this root certificate other certificates can be created (intermediates), that enable other users to digitally sign items in the name of the root via their private keys. Additionally, from intermediate certificates further certificates can be created (either other intermediates or leaf certificates). The last link in the chain is the leaf certificate that can only be used for signing, meaning other certificates cannot be created from a leaf.

All certificates in a certificate chain refer back to the identity that is bound to the root certificate and thus inherit the trustworthiness of the root.



Certificate chain validation

In a public-key certificate no certificate chain is stored. So, in order to validate a leaf certificate at the end of a certificate chain, the complete chain up to the root certificate has to be available.

The maximum path depth from root to leaf that is allowed in a certificate hierarchy is a property of the root certificate. During the creation of the root it has to be set and it will be inherited correspondingly to the lower ranks. Within this path depth certificates can be created from root and intermediate certificates.

When setting up a certificate hierarchy take care that only trusted users receive certificates (i.e. the private key of these certificates). This applies especially to intermediate certificates that can be used to create other certificates.



## Stereoscopic DCP

With the CLIPSTER feature you can also create a stereoscopic DCP and thus material to be screened in 3D. This section explains the items that are specifically available for a stereoscopic DCP and how to create one.

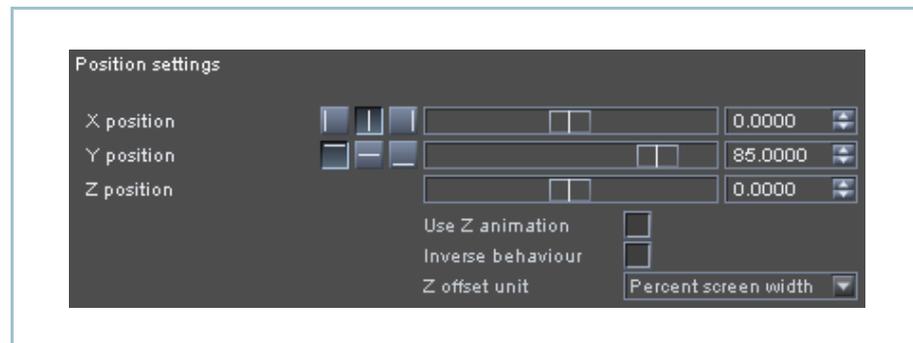
The following topics are covered:

- Preparing a 3D DCP (page 426)
- Creating a 3D DCP (page 427)

### Preparing a 3D DCP

The creation of a 3D/stereoscopic DCP has to be prepared same way as with a usual video file. However, instead of single tracks the content of your project must be available in 3D stereo tracks (see the “CLIPSTER 3D/Stereoscopy” supplement user guide for further information about this).

This applies to subtitles as well: In order to have subtitles in 3D in the DCP the subtitle timeline elements have to be placed in a 3D stereo track instead of a single track. With this you will get in the timeline element properties of a subtitle timeline element for the **Position settings** the **Z position** slider. It can be used to adjust the 3D effect of the selected subtitle(s):



Z-position setting of subtitles

To facilitate the usage of 3D subtitles, the software provides an automatic subtitle depth estimation, meaning it can automatically calculate an appropriate z-position for the subtitles after they have been added to a 3D track. With this only minimal adjustments to the depths of the 3D subtitles should be necessary. For further information about this feature see the “CLIPSTER 3D/Stereoscopy” chapter.



Depth-animated subtitles (variable z-position in XML subtitles) are supported as well, but currently have to be rendered into the images.



A stereoscopic DCP always starts with the left eye clip as the first frame.

## Creating a 3D DCP

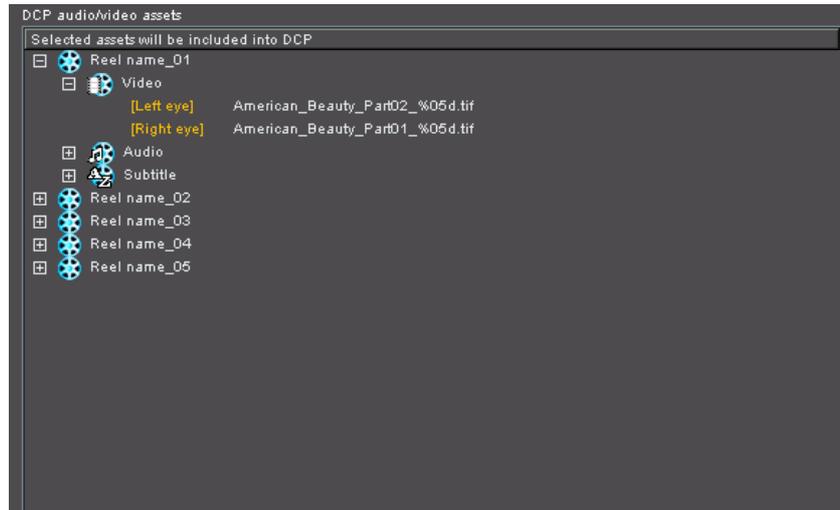
For the creation of a stereoscopic DCP there will be the **Stereoscopic output** settings items available. They can be found in the settings pane of the delivery format configuration step.



Configuring the stereoscopic output for a DCP

To create a stereoscopic DCP, the check box of the **Stereoscopic output** settings items must be activated. With the combo box to the right you can then configure the output type of the 3D DCP. Because the interleaved 3D clip is the native format for a stereoscopic DCP, it must be set to `3D Interleaved stream`. With this the DCP will be created as a stereoscopic DCP.

At the delivery creation configuration step the CLIPSTER will show you for the video assets the sources of the left and right eye clips separately, thereby allowing you to confirm the contents of the 3D DCP.



The assets of a 3D DCP

After clicking on the respective button in the CLIPSTER the stereoscopic DCP will be created according to your settings.

# 3D Stereoscapy

This chapter describes the 3D/stereoscopic workflow feature of CLIPSTER.

The 3D/stereoscopic workflow feature allows you to work with 3D material. The complete production chain from ingest over editing to output/finalizing is supported.

With this you can easily record or import 3D material, add it to a timeline and then edit it: For example, you can control the depth of stereoscopic images and mirror, color match or zoom and pan left and right eye streams independently. During all work the end result can be comfortably controlled either in the video overlay or at the outputs of the R&S DVS system.

Once your work is finished, you can finalize the 3D material in all popular 3D methods (e.g. as separate clips, interleaved, anaglyph, side by side, etc.) or play it out via two separate HD-SDI or DVI outputs to feed two projectors or 3D monitors (also in all popular 3D methods).

The chapter is divided into the following sections:

- Data Preparation for 3D (page 430)
- Merging and Unmerging Video Tracks (page 434)
- 3D Editing (page 438)
- Subtitles in 3D (page 442)
- Viewing and Playing Out (page 445)
- 3D Tools (page 449)
- Automatic Image Geometry Correction (page 454)
- Generating 3D Material (page 458)



## Data Preparation for 3D

Depending on the type of material that is available to you the software has to be prepared differently to be able to work in 3D. This section describes how to prepare the different types of 3D material.

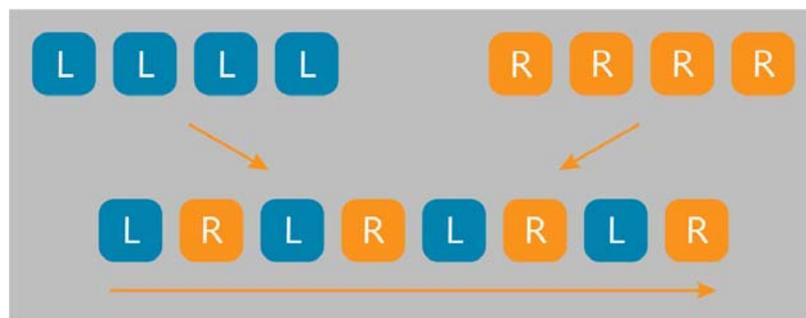
The following topics are covered:

- Types of 3D Material (page 430)
- Preparing Two Separate Clips as 3D Material (page 431)
- Preparing Interleaved 3D Material (page 432)

### Types of 3D Material

Stereoscopic material provides for each human eye a separate video stream (clip), commonly called left eye and right eye clip. They can be stored differently on a storage and the following two types of 3D material can be used in the software.

- Two separate video clips (one for the left eye and one for the right eye).
- A single video clip that contains both eyes by interleaving the two video streams (interleaved video clip):



Interleaving of a 3D video clip



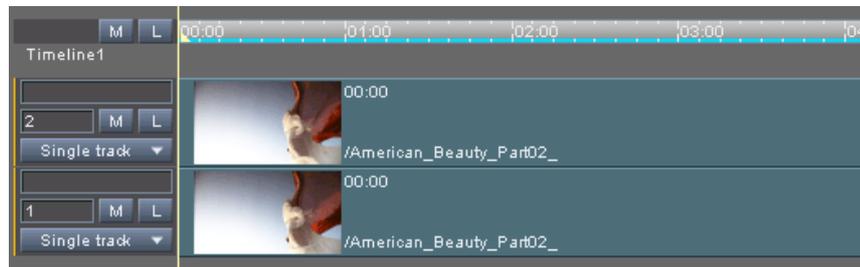
The software starts an operation for 3D (such as a finalizing or playout) with the left eye clip as the first frame. However, by setting the right eye clip to be the left eye clip this behavior can be changed, see "Merging and Un-merging Video Tracks" on page 434.

## Preparing Two Separate Clips as 3D Material

If two separate video clips are available as 3D material, you can add them to separate video tracks in the timeline of the Edit Tool and then merged these tracks to a single stereo track.

Perform the following steps:

1. Add the two clips for the left and right eye to the bin, for example, by dragging them to the contents area of the bin from a file manager or by using the menu option **Add clip...** of the bin's context menu.
2. Configure the timeline to show a second video track, for example, via the timeline output settings or by using the menu option **Track » Add** on the context menu of a video track.
3. Add the video clips from the bin each to a video track in the timeline. It is recommended to add the left eye video clip to the first video track and the right eye video clip to the second video track.
  - ▶ Once this is done, the timeline of the Edit Tool will look similar to the following figure:



- ▶ Now the two tracks can be merged to a single stereo track.
4. Either perform a click on one of the items labeled **Single track** or click on the triangle to the right and select from the drop-down menu the entry **Stereoscopic 3D track**.
    - ▶ The track properties window of the respective track will be displayed on the screen.

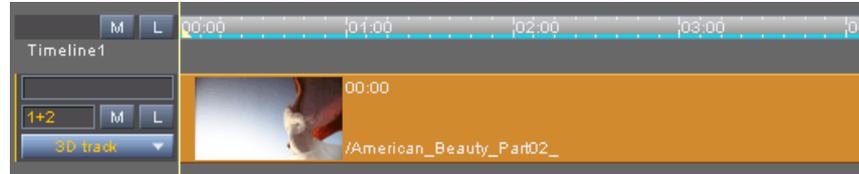


For further information about the track properties window and the track mode item see "Merging and Unmerging Video Tracks" on page 434.

5. In this window activate the radio button **Stereoscopic 3D track** and configure the tracks according to where (in which track) you have added the respective clips.



6. When finished confirm your settings with the **OK** button.
  - ▶ This will merge the two video tracks to a single 3D stereo track in the timeline:



Afterwards the preparations for two separate video clips as 3D material are finished and you can now start your work.

## Preparing Interleaved 3D Material

When only a single video clip is available (i.e. an interleaved 3D clip), you have to alter its bin clip properties accordingly. Afterwards it can be added to a stereo track of the Edit Tool.

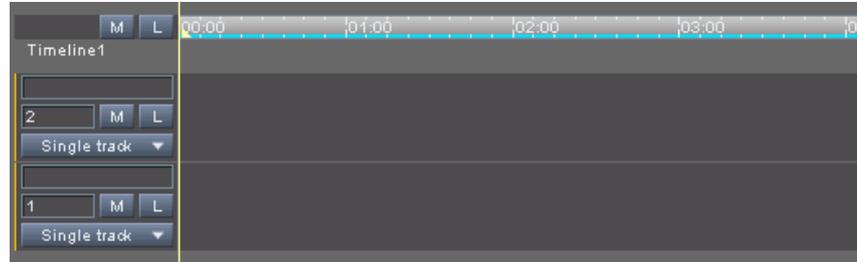
Perform the following steps:

1. Add the interleaved 3D clip to the bin, for example, by dragging it to the contents area of the bin from a file manager or by using the menu option **Add clip...** of the bin's context menu.
  - ▶ Afterwards the interleaved clip will be visible in the contents area of the bin. However, because an interleaved clip is registered by the software just as a normal clip you have to correct its properties to account for its 3D content:
2. Open the properties of the interleaved video clip in the bin (context menu of bin clip » **Properties...**).
  - ▶ The properties window of the bin clip will be displayed on the screen.
3. In this window configure the setting **Stereoscopic Clip** to **Interleaved Stereo** and confirm this with the **OK** button.



- ▶ The clip will now be recognized by the software as interleaved 3D material and, as a result, it can only be added to a 3D stereo track. Thus, you have to provide a 3D stereo track in the Edit Tool for it:

4. Configure the timeline to show a second video track, for example, via the timeline output settings or by using the menu option **Track » Add** on the context menu of a video track.



- ▶ The two tracks can now be merged to a single stereo track:
5. Either perform a click on one of the items labeled **Single track** or click on the triangle to the right and select from the drop-down menu the entry **Stereoscopic 3D track**.



## Merging and Unmerging Video Tracks

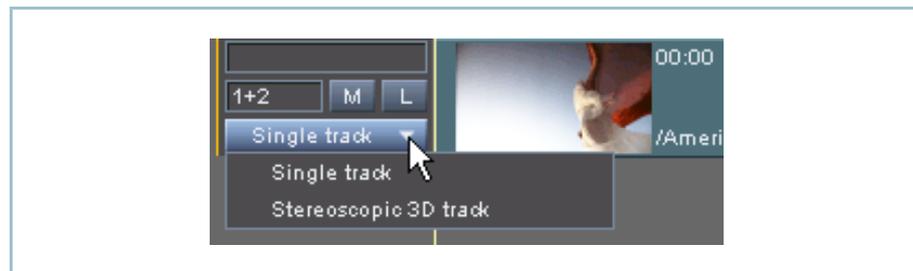
As soon as two or more video tracks are displayed in the timeline they can be merged to a stereoscopic 3D track (stereo track) as well as unmerged.

The following topics are covered:

- Changing the Track Mode (page 434)
- Setting the Track Properties (page 435)

### Changing the Track Mode

To merge or unmerge two video tracks, you have to change its track mode. For this the track mode item right in front of a video track has to be used:



Track mode item

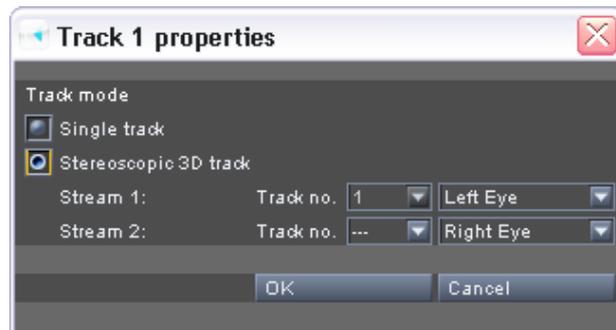
When clicking on the triangle to the right of the track mode item, a drop-down menu will be displayed which can be used to configure the tracks:

Single track	Configures the respective track to a standard single video track of the Edit Tool. If a 3D track already exists, it will be unmerged to two single tracks again, one containing the left eye clip and one the right eye clip. When unmerging a track containing an interleaved 3D clip, it will also be split into two separate clips (left and right eye).
Stereoscopic 3D track	Configures the respective track (and its partner track, if it was a 3D track before) to a 3D stereo track again. If the respective track has not been a 3D track yet, the properties window of the respective track will be opened.

When clicking the track mode item directly, the properties window of the respective track will be displayed immediately.

## Setting the Track Properties

When configuring a track that has not been a stereo track before to a stereo track or when clicking on the track mode item directly, the properties window of the respective track will be opened:



The track properties window

With the track properties window you can set and change the properties of a (stereo) track, for example, by assigning the streams. It provides the following settings items:

Single track	Same as the option Single track of the track mode item, see "Changing the Track Mode" on page 434.
Stereoscopic 3D track	When this option is activated, the tracks as indicated by the items Stream 1 and Stream 2 will be configured to a 3D stereo track. Select the partner track of the first stream (i.e. of the track where the properties window has been invoked) with the Track no. combo box of Stream 2. With the combo boxes to the right you have to assign the streams and determine which of the tracks contains the left and the right eye clip.

 The software starts an operation for 3D (such as a finalizing or playout) with the left eye clip as the first frame. However, by configuring the track of the right eye clip to Left Eye this behavior can be changed.



Once everything is set correctly, you can confirm your settings by clicking the OK button. The Cancel button will close the properties window without altering the states of the track(s).

## Particulars about Merging and Unmerging

There are several particulars that you should be aware of when merging and unmerging video tracks:

### Automatic Activation of Stereoscopic Output Mode

When video tracks are merged to a 3D stereo track, the stereoscopic output mode is automatically activated (button **SETTINGS...** of the timeline area) and it will remain activated for this project if not deactivated manually.

### Interleaved Video Clips

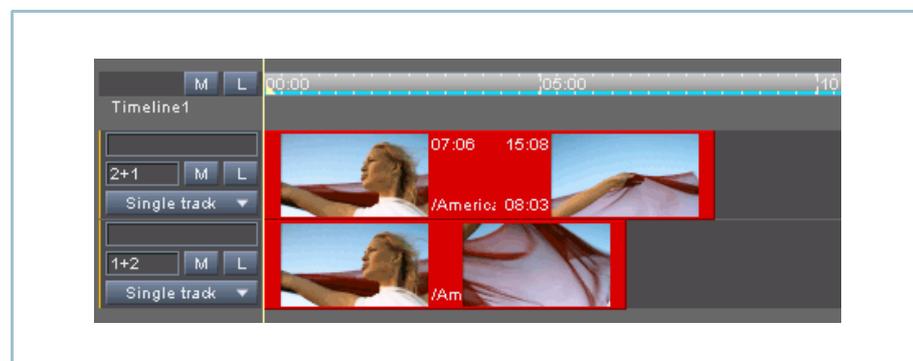
A clip configured as an interleaved video clip can be added to a 3D stereo track only. Its two streams are then accessible to the DVS software. By unmerging a stereo track containing an interleaved video clip, the two streams can be accessed separately as two individual clips, one for the left and one for the right eye.

### Track Numbers

The (first) number in front of a video track indicates the track number. If a second number is displayed with a plus sign in front, it details the respective partner track of this track (either if currently a 3D track or previously configured to one): <track no.>+<partner track no.>.

### Synchronicity

When merging two video tracks to a 3D stereo track, the edit points of the timeline elements in both tracks must coincide, i.e. the timeline elements must be synchronous. If they are not synchronous, you will be informed about this and the respective elements will be particularly highlighted in the timeline area:



Error marked clips in the timeline area



To reset the highlighting, you can resolve the cause for this error and then merge the two tracks, or call the context menu of a video clip in the timeline and select the menu option **Reset error status**. Afterwards the clips will be displayed with their normal color again.

**No Partner Element**

The complementary partner element of a left/right eye clip pair can be left out from the timeline, meaning timeline stretches on one of the tracks to be merged to a 3D track can be left empty. These tracks can still be merged to a 3D stereo track, as long as synchronicity is observed (see above). Then the timeline element without a partner will be duplicated and added to the empty track. When unmerging the track again, you will find instead of just one timeline element identical timeline elements in both tracks.



## 3D Editing

Once 3D material is properly prepared and available in the timeline of the Edit Tool, you can start editing it.

The following topics are covered:

- Editing of a Stereo Track in the Timeline (page 438)
- Effects for 3D (page 438)

### Editing of a Stereo Track in the Timeline

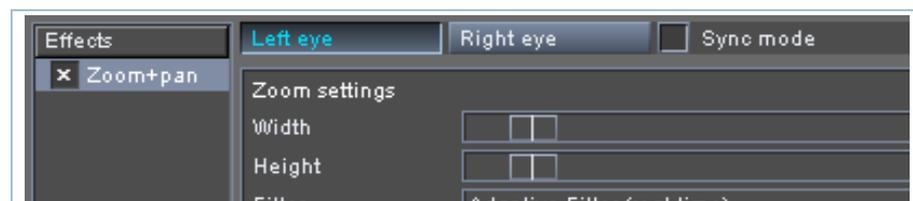
A stereo track available in the timeline area of the Edit Tool can be edited the same way as any standard single video track. The timeline elements on 3D stereo tracks can be, for example, cut or trimmed, or transitions and effects can be applied. All editing work will be applied to both streams at the same time.

### Effects for 3D

Effects operators can also be applied to 3D video clips in a stereo track. They can be applied the same way as to clips in single video track.

#### Effect Operators

In addition to effects that will provide the same features for single as well as 3D clips, there are some special 3D effects operators available: When applied to a 3D video clip, they will offer you independent settings for the left and right eye clip:



Independent effects settings for left/right eye clip

Via the tabs at the top of the settings pane of a 3D effects operator (timeline element properties) you can switch between the settings for the left and the right eye clip. They can be set independently to your liking or to the same settings when the check box **Sync mode** is activated. After activating the check box **Sync mode** the values of the current eye will be copied to the corresponding settings of the other eye. When the mode is deactivated, the eyes can be modified individually.



Settings can also be copied from one eye to the other by using the option **Opposite eye** on the drop-down menu of the item **Modify** among the general items (left) of the properties area.

If a general modification affecting both eyes must be made in addition to individual modifications (or vice versa), a further operator of the same type can be applied to the clip, then performing the general modifications (or the individual ones).

When merging two video tracks with a different set of settings for a 3D effects operator, the effects operator will retain their individual settings for each eye for the timeline element in the stereo track. When unmerging a stereo track, each timeline element will provide the 3D effects operator where the individual settings for each eye can be found.



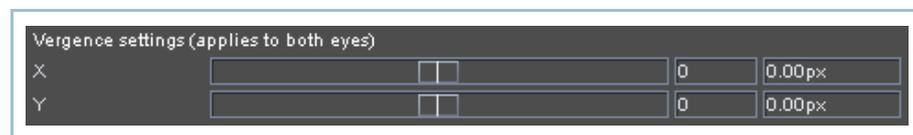
When merging two video tracks with standard effects operators (not 3D effects operators) applied to the timeline elements, the effects operators will be copied from the elements of the first stream to the elements of the second stream.

The following effects are available as 3D effects operators:

- Zoom+pan
- Flip+flop
- 1st color correction
- Operators of the effects group 'RAW'

### The Operator 'Zoom+pan'

The 'Zoom+pan' effects operator is by default available for each video clip in the timeline. On a 3D video clip it provides in addition a setting to control the vergence.



Vergence settings

With the Vergence settings you can correct the depth of a stereoscopic image, i.e. you can adjust the zero parallax. When using the Vergence settings both eyes will be modified simultaneously regardless of the state of the Sync mode check box. The setting for vergence cannot be set differently between the two eyes.



### The Operator 'Flip+flop'

On 3D video clips the effects operator 'Flip+flop' is used mostly to correct streams created by special stereo camera rigs. With it you can mirror the streams independently.

Some file formats provide metadata information about their arrangement on the camera rig when shooting in 3D. Such clips may receive the flip/flop operator automatically according to their metadata.

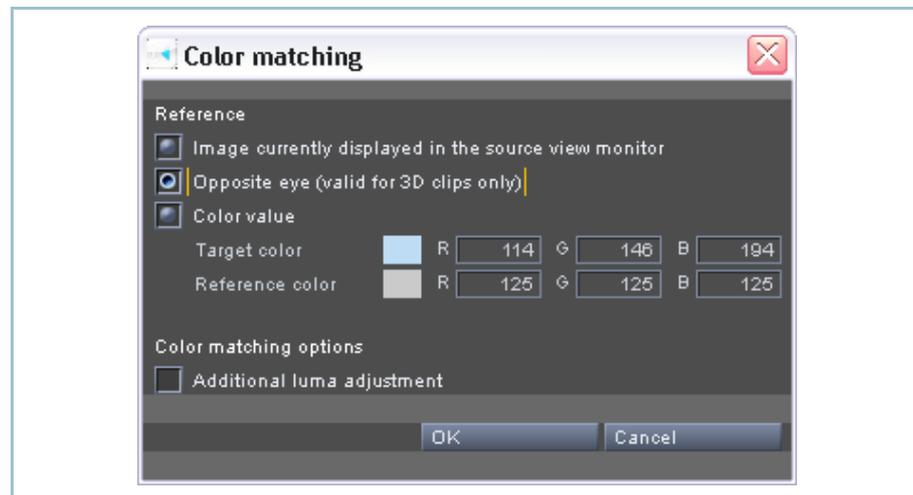
With the check boxes in the settings pane of the flip/flop operator you can mirror either the left or right eye clip according to your needs.

### The Operator '1st color correction'

The effects operator of the primary color correction is also available for 3D video clips.

When shooting in 3D with two cameras, the colorimetry of both eyes can slightly differ, even if the cameras are of the same model. Then it is important to adjust both eyes to an identical look by grading one eye separately from the other. For this you can apply a primary color correction operator and color correct one eye to match it to the other one.

This can also be performed with the automatic color matching feature of CLIPSTER (context menu of timeline element » **Color matching**). To color correct one stream of a 3D video clip, it provides the setting **Opposite eye (valid for 3D clips only)**:



Window to configure an automatic color matching

Once this setting has been selected and confirmed with the button **OK**, the automatic color matching will analyze the opposite eye and apply a primary color correction operator to the 3D clip where the currently displayed eye is color corrected.



After a color matching of the two eyes has been performed, the final look for a scene/clip can be achieved by applying another primary color correction operator on top and using it with **Sync mode** activated.



## Subtitles in 3D

Subtitles (integral texts or images) can be used in 3D as well. For this you can either equip 2D subtitles with depth information in the software or you can use 3D subtitles, i.e. depth-animated subtitles, which will provide the depth information automatically. For further information about how to work with and use subtitles in general see „DCI Mastering“ > „Adding Subtitles“ (page 374)

The following topics are covered:

- Adding 3D to 2D Subtitles (page 442)
- Using Depth-animated Subtitles (page 443)

### Adding 3D to 2D Subtitles

The 3D/stereoscopic feature can be used for 2D subtitles (subtitles without any depth information) as well. Once such a subtitle file (XML or MXF) has been added to a 3D stereo track, 3D information can be added to the subtitles.



To facilitate the process of adding depth to subtitles, CLIPSTER can automatically calculate an appropriate parallax for the subtitles.

Perform the following steps:

1. On the subtitle timeline element perform a right-click of the mouse to call up its context menu.
2. Select in the submenu **3D** the menu option **Automatic subtitle depth estimation**.
  - ▶ Then the automatic subtitle depth estimation performs a rough setup of the parallax of the subtitles. After this it is recommended to check the resulting parallax and to correct it manually if required
3. Display the subtitle's timeline element properties either by double-clicking the subtitle timeline element in the timeline or by selecting **Show » Effect properties** from its context menu.

- Select one or more subtitles and modify the setting items **Z position** that can be found among the **Position settings**. They can be used to manually adjust the 3D effect of the selected subtitle(s):



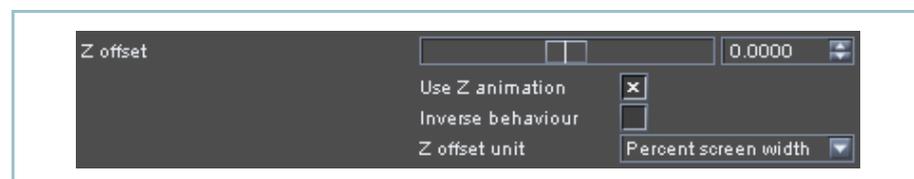
Every time the parallax of the 3D material or the position of the subtitle changes, the z-position of the subtitle must be checked and readjusted if necessary.

## Using Depth-animated Subtitles

Depth-animated subtitles are also supported in the CLIPSTER software. These subtitle files already contain the required depth information via a variable z-position that determines the position of the subtitles along the z-axis and the software accurately moves the subtitles. This enables the subtitles to flow back and forth in the depth of the 3D images together with the scene.

To use such a subtitle file, you have to add it to a 3D stereo track in the timeline. Afterwards it can be used same as any normal subtitle file.

However, the settings items for the z-position among the **Position settings** will be different for a depth-animated subtitle. After one or more subtitles have been selected you will see the **Z offset** settings items instead of the **Z position** items:



Z-animation settings of subtitles



<b>Z offset</b>	These items determine the offset that will be added to the variable z-position specified in the subtitle file.
<b>Use Z animation</b>	Turns on or of the variable z-position. When turned off you can set the <b>Z position</b> items will be displayed again instead of the <b>Z offset</b> items.
<b>Inverse behavior</b>	Reverses the effect of the variable z-position.
<b>Z offset unit</b>	Allows you to specify the unit of the <b>Z offset</b> items (pixel or percent). However, for internal reasons pixel values cannot be translated directly to percent and back, they have to be divided by 100: For example, a value of 19.2 pixels (for a clip in 1920 × 1080) is the same as 20% when the unit is set to percent.

## Viewing and Playing Out

Your work on 3D material can be easily controlled via the video overlay or a monitor connected to the outputs of the system. For example, an anaglyph emulation mode allows you to control the 3D depth of the material on the fly in the video overlay, and afterwards it can be played out in all common 3D methods.

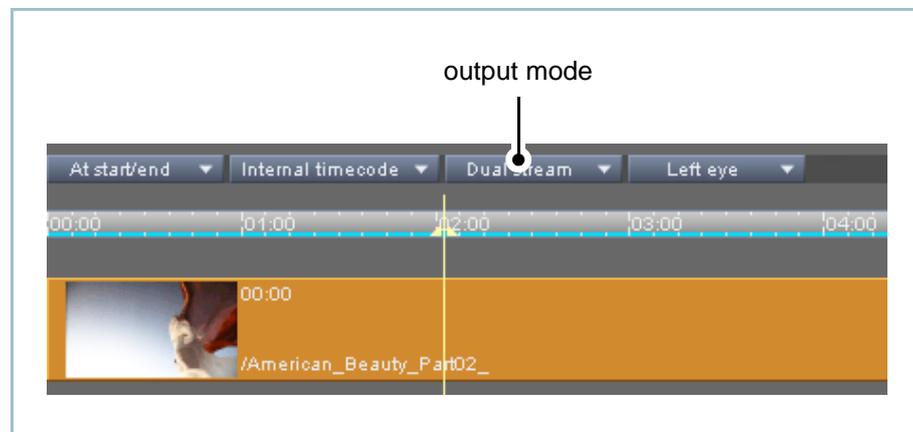
This section explains how to configure and set up the display of the 3D material in the software as well as at the outputs of the system.

The following topics are covered:

- Configuring the Output Mode (page 445)
- Configuring the Display (page 447)
- Configuring the Output (page 447)

### Configuring the Output Mode

To determine what will be displayed in the video overlay and at the outputs of the system, the output mode combo box has to be used:



The output mode combo box



This item will be available when the stereoscopic output mode is activated and/or video tracks are merged to a 3D stereo track in the timeline.

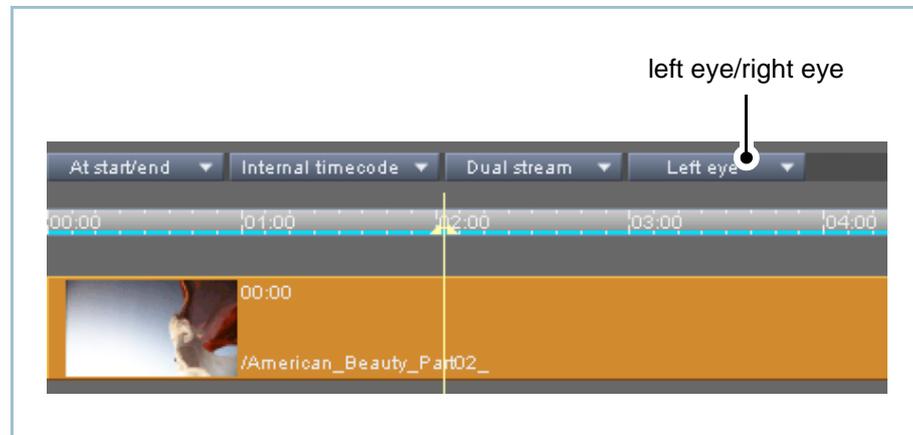
The output mode combo box provides the following options:



<b>Single stream</b>	<p>When this option is selected, the 3D track in the timeline will be displayed as if it were a standard single video track. The video overlay as well as the outputs show all one stream of the 3D track only. You can select the stream that should be displayed with the left eye/right eye combo box .</p>
<b>Anaglyph red-cyan</b> <b>0% saturation</b> <b>Anaglyph red-cyan</b> <b>100% saturation</b>	<p>These options combine the two streams of the 3D track to a single anaglyph stream for red/cyan glasses and display it in the video overlay as well as at the outputs of the system. You can choose between two saturations (0 or 100%) for the color of the 3D material.</p>
<b>Anaglyph red-green...</b>	<p>Same as <b>Anaglyph red-cyan...</b>, but the anaglyph stream is for red/green glasses.</p>
<b>Side - by - side</b> <b>Top - bottom</b> <b>Interlaced</b> <b>Blending</b> <b>Checker board</b> <b>Luma difference</b>	<p>These options combine the two streams of the 3D track to a single stream and display it in the video overlay as well as at the system's outputs (e.g. for special 3D displays). You can choose between displaying the two images side by side, top/bottom, interlaced, blended together (left eye 75%, right eye 25%), in a checkerboard pattern, or with their differences in luminance shown. The <b>Checker board</b> and <b>Luma difference</b> options are available for an analysis of the two 3D streams.</p>
<b>Dual stream</b>	<p>Displays the two streams of the 3D track independently at two different output ports of the system. The output ports can be configured with the timeline output settings . With this the control area (video overlay) shows both streams next to each other in two separate overlays.</p>

## Configuring the Display

What to display in the user interface of the software can be configured with the left eye/right eye combo box:



The left eye/right eye combo box



This item will be available when the stereoscopic output mode is activated and/or video tracks are merged to a 3D stereo track in the timeline.

With the left eye/right eye combo box you can select, depending on the setting for the output mode, which of the streams to view in the video overlay. Additionally, it controls whether the left eye or right eye stream/clip should be displayed by the representations of the video clips in the 3D track.

Furthermore, in the **Single stream** output mode it effects the signal displayed at the output ports of the system.

## Configuring the Output

Via the **Settings...** button you can set up and configure the output of stereoscopic material as well as the output ports that should be used for this. It is located at the top left side of the timeline area.

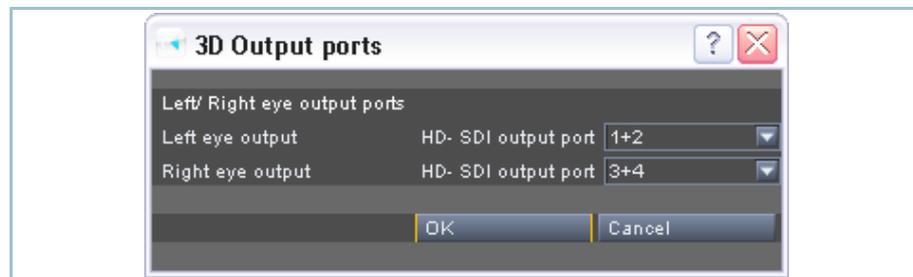
After pressing this button the **TIMELINE OUTPUT SETTINGS** window will be displayed on the screen. At the bottom of this window you can find the **OPTIONS** area where further optional settings are provided. To the right you can find the settings items for a configuration of the stereoscopic output.



Configuring the stereoscopic output

With the check box of the **Stereoscopic output** settings you can turn on or off the stereoscopic output mode of the system. It will be automatically activated when tracks are merged to a 3D stereo track in the timeline. When deactivated manually, a single stream of a 3D track will be shown in the video overlay as well as at the outputs of the system only.

By clicking the button **3D OUTPUT PORTS...** the HD-SDI output ports of the DVS system can be configured. It opens the following window:



Configuring the output ports

In this window you determine on which of the HD-SDI output ports of the system to give out the left eye and right eye stream of a 3D stereo track in the timeline when the output mode combo box is set to **Dual stream**.

Once everything is set as desired, the configuration of the stereoscopic output is complete and you can view the 3D material as configured via the HD-SDI outputs of the system.

## 3D Tools

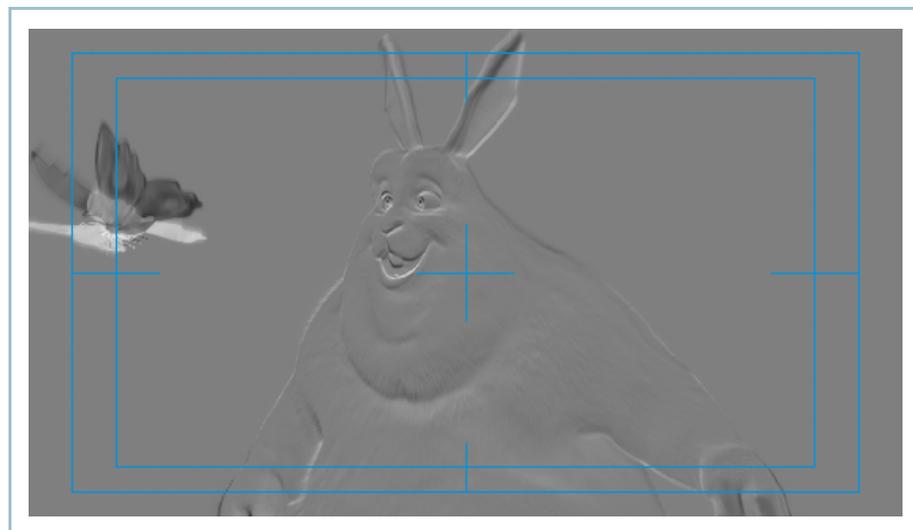
The DVS software provides a comprehensive tool set especially available for 3D to analyze the effects of a stereoscopic project. All issues found can be easily resolved with, for example, the zoom and pan settings or the effects available for color correction (see ). This section describes the various tools provided for the analysis of a 3D project.

The following topics are covered:

- Luma Difference (page 449)
- Divergence Safety Area (page 450)
- Checkerboard (page 451)
- 3D RGB Histogram (page 452)
- 3D Depth Histogram (page 453)

### Luma Difference

The luma difference view is one of the output modes of the software. It shows you the differences between the luminance of the two video streams (left and right eye) and can be used to examine the 3D effect of your project without additional glasses.



Luma difference output mode



The zero parallax or screen plane can be found where no elements appear, i.e. those parts of the image that are uniformly gray. The elements of the images that can be seen in the luma difference view will appear either in front or behind the screen plane. By shifting the images of the two streams horizontally with the Vergence settings of the zoom and pan operator you can relocate the screen plane and the elements of the images.

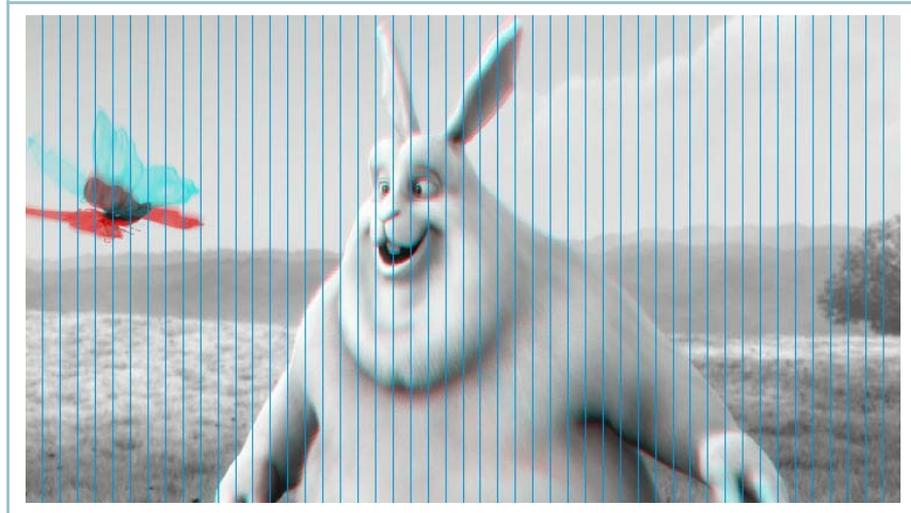
## Divergence Safety Area

Depending on the width of the source image and the size of the display, a depth value can be calculated wherein all 3D objects of your project should be located: the so called depth volume or depth budget. To check the depth budget, the software provides the divergence safety. It can be activated/deactivated with the menu option **Show divergence safety area** on the context menu of the video overlay:



Activating the divergence safety area

Once activated, a grid will be displayed on the video overlay:



Activating the divergence safety area

The distance between the lines indicates the safe parallax that should not be exceeded in order to avoid negative 3D effects for the audience. The safe parallax varies depending on horizontal image resolution and screen size. It can be calculated as follows:

$$\text{Horizontal image resolution (px)} / \text{Screen size (in)} \times 2.5$$

You can set up the color and distance between the lines (in percent of the horizontal image resolution) via the Configuration Tool.



The setting for the divergence safety area must be adapted when either the timeline output resolution is changed or the size of the target screen that the 3D material is intended for.

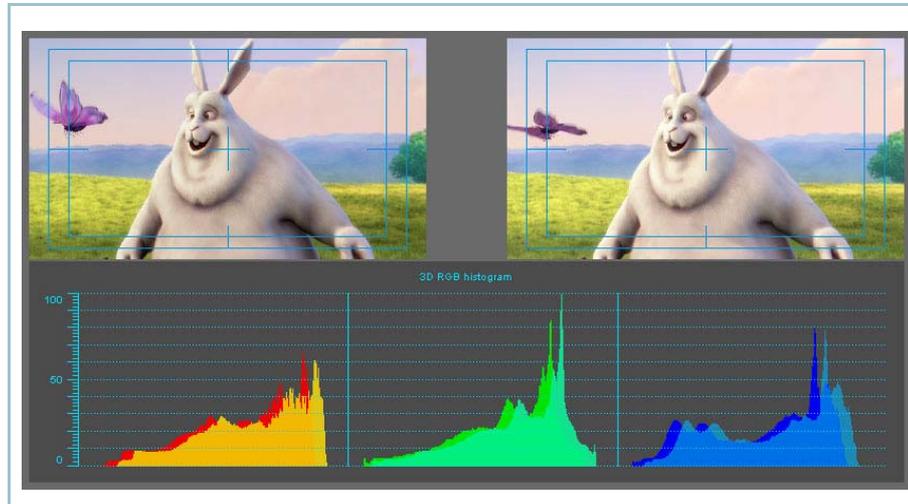
## Checkerboard

The checkerboard view is also one of the output modes of the software. It enables you to check possible color mismatches or vertical misalignments of two images of a 3D clip easily:



## 3D RGB Histogram

The 3D RGB histogram can be used to color correct stereo images. The 3D histogram overlaps the RGB histogram of both streams in a single diagram and clearly shows whether there is a color mismatch in the stereo images:

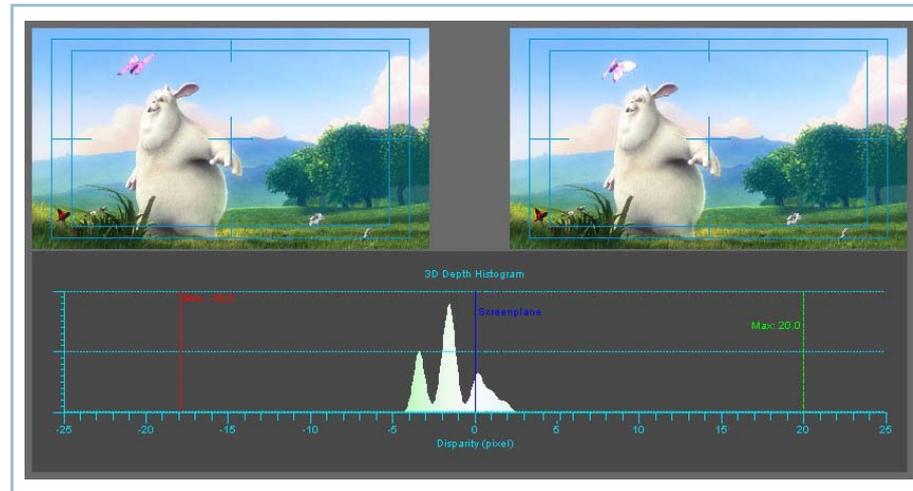


3D RGB histogram showing color mismatches

The 3D RGB histogram can be activated/deactivated via the context menu of the video overlay by selecting **Analyzer > 3D RGB histogram**. To use it, the output mode should be set to **Dual stream**.

## 3D Depth Histogram

The 3D depth histogram can be used to monitor the compliance of depth limits for specific applications. It delivers a reliable visual representation of the 3D depth:



3D depth histogram

The 3D depth histogram can be activated/deactivated via the context menu of the video overlay by selecting **Analyzer » 3D depth histogram**. To use it, the output mode should be set to **Dual stream**. A graph in the left half of the diagram (negative values) means that objects are located in front of the screen plane, and a graph in the right half of the diagram shows that objects are behind the screen plane.



## Automatic Image Geometry Correction

When shooting in 3D with two separate cameras, it can be difficult to set up the two cameras properly. To cope with such issues later, the software provides an integrated tool that is able to analyze the stereoscopic content available in the timeline and correct geometry issues automatically. The 3D auto correction (also known as the stereoscopic analyzer STAN) will deal with problems such as scale mismatches, vertical offsets, rotation issues, or keystone distortions.

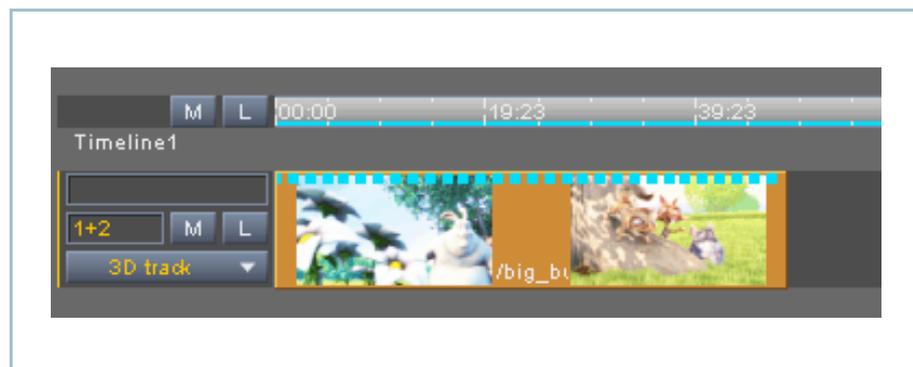
The following topics are covered:

- Understanding 3D Auto Correction (page 454)
- 3D Auto Correction from the Timeline (page 455)

### Understanding 3D Auto Correction

A 3D auto correction consists of two steps: First the analysis of the stereo material and then the rectification.

When a 3D auto correction is started, it will begin with an analysis where the key frames for the material are chosen and evaluated. If required, this is followed by an automatic correction of most geometry issues. You will be informed about the progress of all this via a progress bar on the screen. Afterwards the key frames will be visually marked on the clip(s) of the timeline:

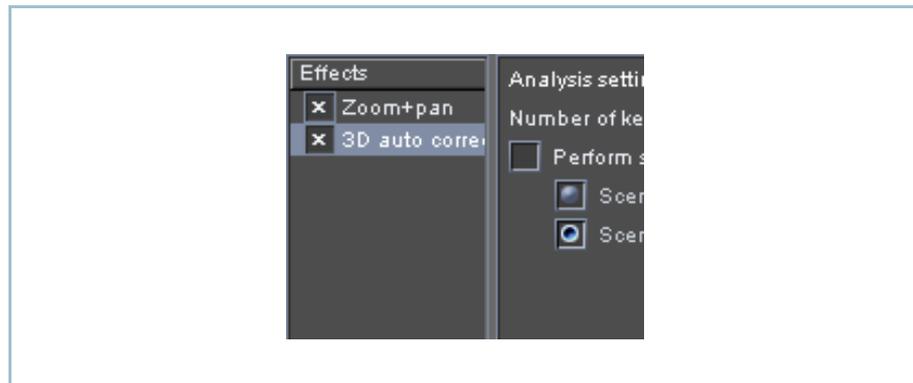


Key frames on clip in timeline

The geometry issues that have been corrected during this step (e.g. for scale mismatches and vertical offsets) have been virtually applied to the clip(s) via internally adjusted zoom and pan settings. During playout they will be applied to the clip(s) on the fly in real time.

When performing a 3D auto correction that should correct warping (keystone distortions) as well, the material must be prerendered after the 3D auto correction to finally apply the corrections.

At any time after an analysis you can adapt the basis for the corrections, i.e. the key frames that will be taken as a basis. Each analyzed video clip in the timeline receives during an analysis an additional effects operator for the key frames and the corrections that should be performed:



Effects operator for 3D auto correction

### 3D Auto Correction from the Timeline

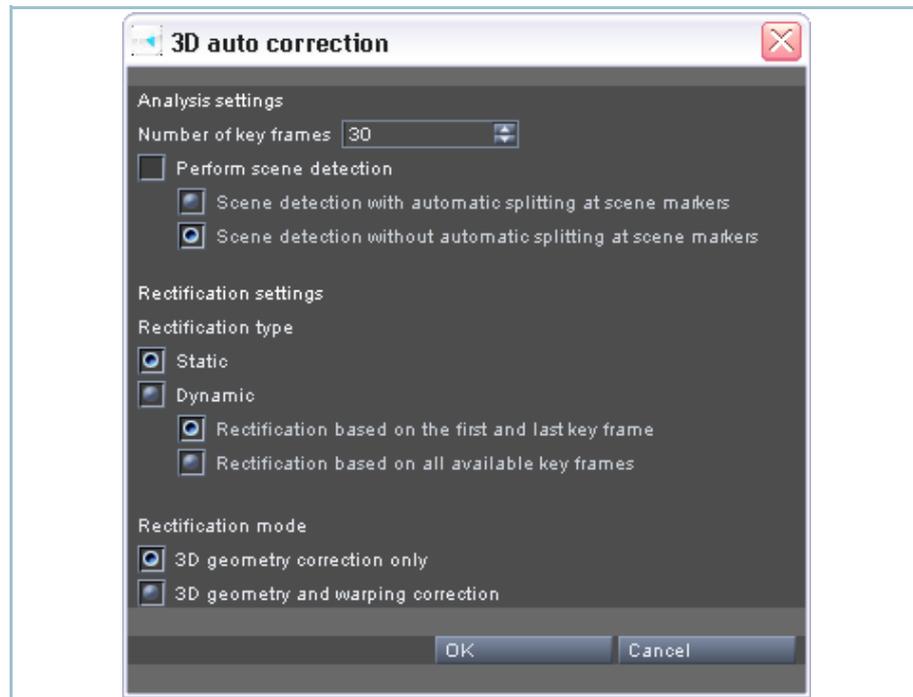
For an analysis of one or more clips in a 3D stereo track you can start the 3D auto correction from the timeline:

- 1 Select the clips that should be corrected directly from the timeline.
- 2 Then select from the context menu of a clip in the submenu of the menu option **3D** the option **Auto correction**.



Alternatively, with the menu option **3D auto correction** on the context menu of the timeline scale you can start an analysis of all clips on the timeline. It will use the uppermost unlocked video track of the timeline and can be limited to a range of the timeline by setting the timeline's in- and outpoint.

A dialog window will be displayed on the screen:



Automatic correction of 3D geometry issues

For the analysis of the stereo material you have to define a number of frames that should be analyzed per clip (**Number of key frames**). The higher the number of key frames, the longer the analysis will take.

By activating the check box **Perform scene detection** of the **Analysis settings** you can initiate a scene detection prior to the analysis. If this is performed with an automatic splitting at scene markers, you will get a more accurate analysis, because the number of key frames will be applied to each split scene.

For the **Rectification type** you can select between **Static** and **Dynamic**. When **Static** is selected, the correction will be performed on the average of all existing key frames. With **Dynamic** selected, it will be made either by using the first and last key frame or by using all key frames separately as a basis. The dynamic rectification is recommended if there is a tracking shot in the scene.

With the settings under **Rectification mode** you determine what to correct for the stereo clip. For simple geometry issues such as scale or rotation the setting **3D geometry correction only** can be used. The setting with warping correction will rectify keystone distortions as well. However, this setting is comparatively slow because to finally apply the keystone correction, a prerendering is required.



Once the settings of this window are confirmed with the button **OK**, the analysis will be started. When finished, each analyzed clip will provide the effects operator for 3D auto correction in the effects list of its timeline element properties. If required, the simple geometry issues have been corrected as well.



## Generating 3D Material

This chapter explains how to generate 3D material with the R&S DVS system and its software. It will be explained how to finalize a project in 3D and how to record material in 3D.

The following topics are covered:

- Finalizing 3D Material (page 458)
- Recording 3D Material (page 459)

### Finalizing 3D Material

3D material can be created via a finalizing. For this your content must be appropriately prepared with the video data in 3D stereo tracks (see "Data Preparation for 3D" on page 430). Then it can be finalized in 3D.

In the finalize dialog you can find among the optional items for a video output the setting **Stereoscopic output**:



Configuring the stereoscopic output for a finalizing

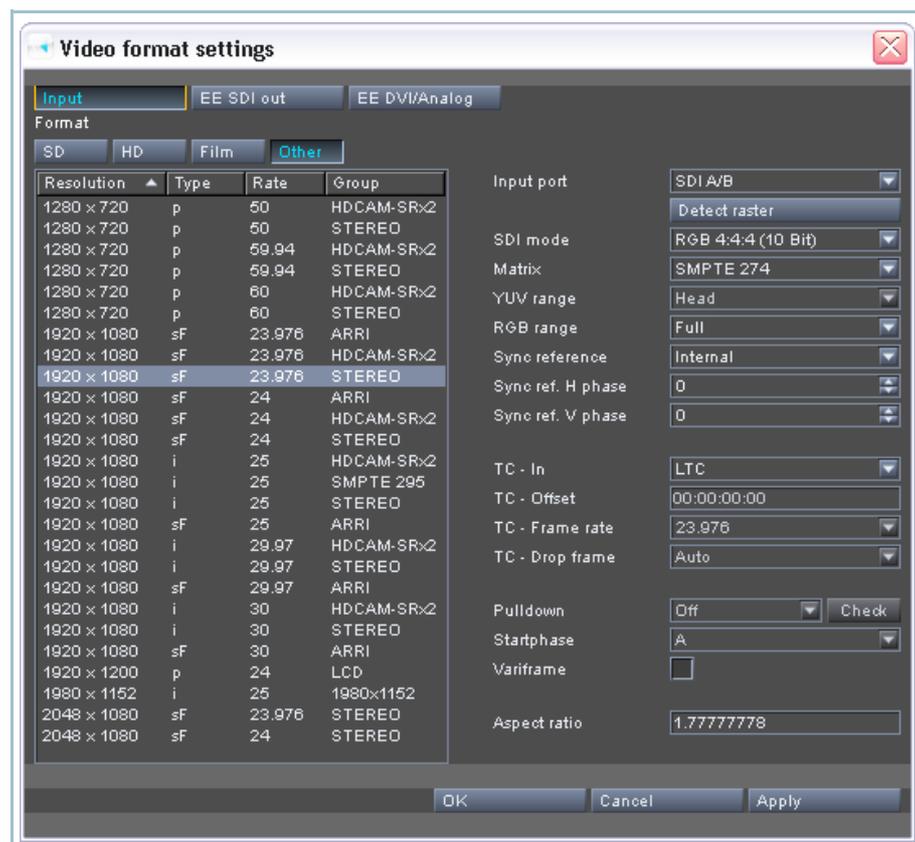
To create stereoscopic content via finalizing, the check box of the **Stereoscopic output** setting must be activated. With the combo box to the right you can then configure the output format of the 3D material. The following settings are available:

3D Interleaved stream	The 3D stereo track will be finalized into an interleaved clip, see "Types of 3D Material" on page 430.
3D Dual stream	Two separate clips, one for the left eye and one for the right eye, will be created.
3D Anaglyph R/C stream...	The two streams of the 3D track will be combined to a single anaglyph stream for red/cyan glasses and then finalized to a clip. There are two settings available for this that can be used to select the saturation of the images' colors (0 or 100%).

3D Anaglyph R/G stream...	Same as 3D Anaglyph R/C stream..., but the anaglyph stream is for red/green glasses.
3D Single stream...	The two streams of the 3D track will be combined to a single stream and then finalized to a clip. You can choose between finalizing the two images side by side, top/bottom or interlaced.

## Recording 3D Material

With the CLIPSTER software you can also capture 3D material. This has to be performed in the optionally available I/O Tool software module. When configuring the input format, you can find sorted under the video format type **OTHER** (button **Other**) several rasters tagged with **STEREO** in the column **GROUP**.



Configuring an input



These video rasters can be used to record a 3D dual stream. The two streams must be available at the input ports of the system (HD-SDI input ports A/B and C/4 (dual link; in single link ports A and B only)). The left eye will be captured at the ports A/B and the right eye at C/4 (dual link; in single link ports A and B only). Once the video format settings are confirmed the combo box **Stereoscopic output** among the general settings for the record operation (storage information) will be available:



Configuring the stereoscopic output for a record

With this the two streams will be captured according to your settings as soon as the record operation is started.



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# Conforming Tool

With the conforming tool of the CLIPSTER you can conform, for example, offline composed projects.

This chapter explains how to conform data lists (e.g. EDLs or cut lists) with the CLIPSTER. The chapter is divided into the following sections:

- Understanding Conforming (page 462)
- Importing and Adding EDLs (page 465)
- Building up a Timeline (page 469)
- Conforming (page 474)
- Working with EDLs from the Timeline (page 480)
- The Conforming Mode - Overview (page 483)



## Understanding Conforming

This section provides an introduction to conforming and the conforming tool in general. Additionally, you can find here some important notes about what to observe prior to a conforming process.

The following topics are covered:

- Conforming in General (page 462)
- The Conforming Tool and its Mode (page 462)
- Important Notes (page 463)

### Conforming in General

Conforming in general is the process of linking a data list, such as a cut list or a list in the edit decision list (EDL) standard, to audio/video material on a storage which enables one to work further on already edited projects. On a R&S DVS system this would normally be the linking to the original high-resolution material thereby taking advantage of the real-time power of the system for further processing.

A conforming may be required, for instance, during the editing of digital movie shots in film projects: An editor cuts scenes of the film on an editing workstation using low-resolution material. When finished, an EDL can be created of the created project which can afterwards be sent to other editors (i.e. only the EDL has to be sent). This EDL can then be imported in other applications and after a conforming the work on the respective project can be continued (e.g. color graded).

### The Conforming Tool and its Mode

The conforming tool of the CLIPSTER has been designed for an easy and fast conforming: With it you can load (import) data lists, build up a timeline from them as well as set up and perform the conforming. It can handle EDLs (type CMX or GVG) and other data lists, such as ALEs or cut list.

Once everything is set up correctly, the conforming will be successful and you will receive in the timeline properly linked clips. Then you can continue your work on the project immediately.

However, if the first steps of a conforming procedure fail, you have to adapt the conforming, for example, by applying another linking method or by editing the events of the EDL. This can be done either directly in the timeline or by using the conforming mode of the Edit Tool. Then you can, for example, configure individual clips or complete reels to the requirements of your conforming. Additionally, with the conforming mode you can easily determine offsets, adjust reel names or in- and outpoints.

Furthermore, the conforming mode can also be used to verify the result of the conforming. With the split screen function of the preview area you can easily compare the built-up EDL in the timeline with a low-resolution clip created from the offline edited EDL frame accurately.

## Important Notes

This section provides some notes that should be observed prior to performing a conforming.



For a conforming with source timecode or keycode \*.dpx, \*.mov, \*.mxf as well as REDCODE and Broadcast Wave files are supported.

For further information about Spycer see the “Spycer” user guide.

If, no matter what, a conforming persistently fails for certain events, they can be manually referenced to source material by relinking them. However, then no new bin clip will be created, but the properties of this event will be changed.

### General

The most important concept for a successful conforming is that you should know your source, for example, whether the files to be conformed provide a timecode via their frame numbering, whether the directories are named according to reels, or the files' headers provide source timecodes and/or reel names, etc. To be successful, the conforming has to be set accordingly.

The frame rate of the imported EDL must be set correctly: It must be set to the native frame rate of the EDL, otherwise the timecodes will be calculated wrongly. Please observe a possible drop-frame timecode as well.



An autoconforming can be performed with source timecode, keycode or file numbers. Offsets cannot be set at this stage. For this you have to use the conforming mode.

Cut lists without source in- and outpoints will be automatically provided with this information by the DVS software. They will be calculated from the data available in the list. However, this information may require manual adaptation.

To add the EDL to the timeline, the frame rate of the video format of the timeline must match the frame rate of the imported EDL. For this you can either set the timeline's frame rate to the frame rate of the EDL or convert the timecodes of the EDL to another frame rate. Please observe a possible drop-frame timecode as well.

### **Conforming with Header Data**

When autoconforming on a connected storage (Disk Online) with the setting Source TC (in header), make sure that the default source timecode (setting Default source TC) is set correctly in the timecode settings of the Configuration Tool (see Configuration Tool user guide for more information). If not set correctly, a conforming will always fail.

To be successful, the frame rate detailed in the header data should match the frame rate of the EDL.

R&S DVS stores in the headers of \*.dpx image files at a location for user-defined data the reel (tape) names. To avoid conflicts due to identical source timecodes/keycodes, this information can be used for a conforming to distinguish between different reels. However, files created by other systems may not provide reel names in their headers. Then a search for reel names should be either deactivated or limited to the folder or file names.

Via Spycer you can take a look at the header data provided by the files to determine, for example, that the appropriate source timecodes/keycodes, frame rate or reel names are available. If required, the header data can be adjusted.

## Importing and Adding EDLs

EDLs can be used very easily in the CLIPSTER: They just have to be imported and added to the bin of the CLIPSTER.

To do this, you can use the same procedures as to add a clip to the bin. However, instead of being available in the contents area of the bin, EDLs will be added to the folder area.



When adding an EDL this way, you have to observe where to add the EDL. An EDL can only be imported to a standard folder of the bin (e.g. the root folder). Vice versa, standard clips from the storage cannot be added to an EDL folder.

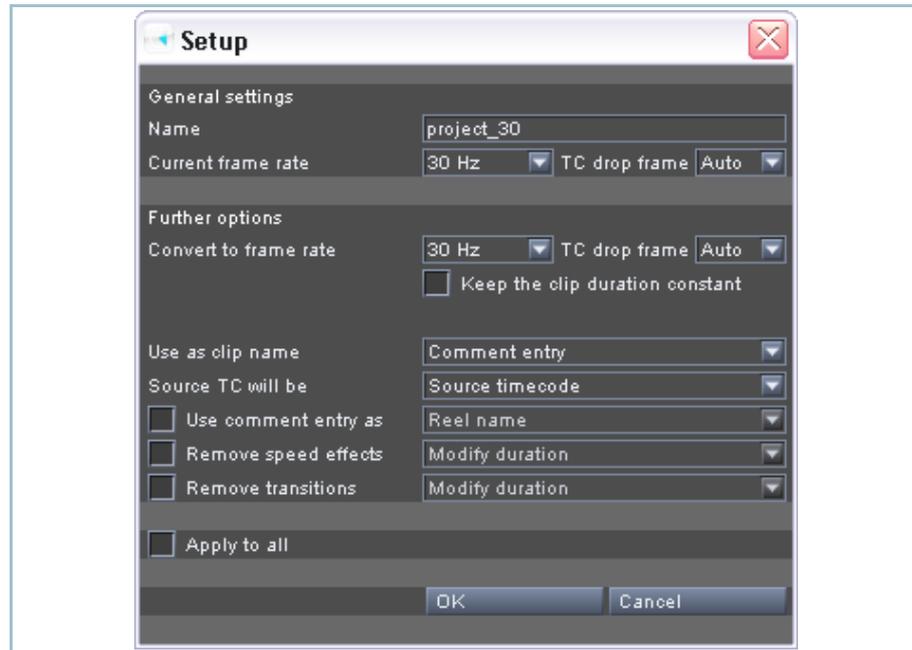
In addition to the above said you have the following possibilities at hand to import and add EDLs:

- Call up the context menu on a folder in the folder area of the bin and select the type of EDL that you want to add from the menu options **Add ALE...**, **Add Cutlist...**, **Add EDL...**, or **Add FCP XML...**
- Use one of the above mentioned menu options on the menu **Project** of the menu bar.

These possibilities open the standard dialog window of the operating system for the selection of a file. select the EDL file from the list box or enter its name in the entry field **File name**.

File extensions:	*.ale	Avid Log Exchange file
	*.ctl	Cut list file
	*.edl	EDL file
	*.xml	Final Cut Pro XML file

After confirmation a configuration window similar to the following will be displayed on the screen:



Example dialog window to configure an EDL



Depending on the type of EDL added, the configuration window may provide different settings items. The descriptions below detail all items that can be available, even if not present in the figure above.

Item	Description
<b>Name</b>	This field determines the name of the EDL as it will appear in the bin. It can be altered freely.
<b>Current frame rate</b>	Sets the frame rate of the EDL, i.e. the video raster's frequency that was used during the creation of the list. If not already set correctly, select the matching frame rate from the drop-down list of the combo box.
<b>TC drop frame</b>	Sets whether drop-frame timecode should be applied to the frequency indicated in the combo box to the left.
<b>Gauge</b>	<i>Cut lists only:</i> Allows you to set the type of film as well as its perforation. Select the matching type from the drop-down list of the combo box.

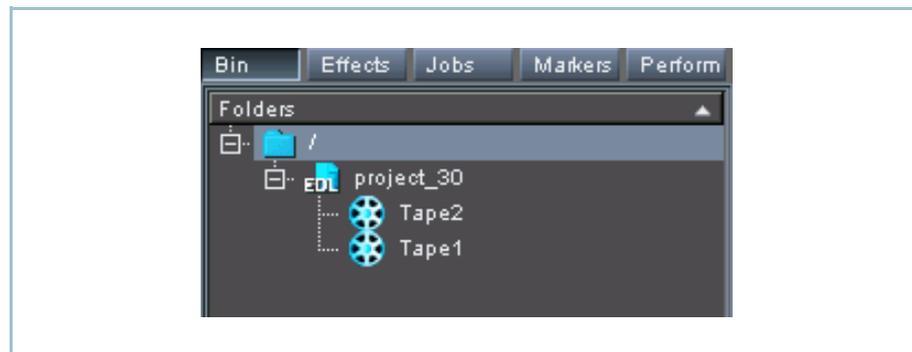


Item	Description
<b>Extension</b>	<i>Cut lists only:</i> Determines how to interpret the reference numbers of the keycode information in the files' headers on the storage, i.e. whether they should be interpreted as frames or perforations. By default the keycode reference numbers of cut lists are interpreted as frames by the DVS software.
<b>Convert to frame rate</b>	Converts the frame rate set with <b>Current frame rate</b> to another frequency. It recalculates the in- and outpoints and the durations will be adjusted (see also <b>Keep the clip duration constant</b> ). Select from its drop-down list the frequency that the added list should be converted to.
<b>TC drop frame</b>	Same as <b>TC drop frame</b> above.
<b>Keep the clip duration constant</b>	Will be observed during a frame rate conversion. Then, the in- and outpoints of the clips in the list are recalculated, keeping the events' durations constant.
<b>Use as clip name</b>	Specifies what should be used as names for the EDL events.
<b>Use as reel name</b>	<i>Cut lists and FCP XML files only:</i> Sets what should be used for the reel names.
<b>Source TC will be</b>	Configures what will be used as the source in- and outpoints. With this you can select, for example, that the destination in- and outpoints should be used as the source in- and outpoints.
<b>Use comment entry as</b>	<i>ALEs and EDLs only:</i> Uses comment entries in the EDL as reel names or as the path for an online-conforming. The first comment entries of the events will be interpreted.
<b>Remove speed effects</b>	<i>EDLs and FCP XML files only:</i> Removes speed effects included in an EDL by either modifying or keeping the durations of the events.



Item	Description
<b>Remove transitions</b>	<i>EDLs and FCP XML files only:</i> Same as <b>Remove speed effects</b> only for transitions.
<b>Apply to all</b>	In case you have added several EDLs to the bin in a single step (e.g. via drag-and-drop of more than one EDL from a file manager to the bin), each will usually invoke a setup window. When activating this check box, the currently specified settings will be applied to all EDLs, i.e. you have to set them only once.

Once everything is set as wanted, confirm your settings with the **OK** button. This will start the import process. When finished, the selected and configured EDL can be found in the folder area of the bin with the clips of the EDL already sorted into reel subfolders. Of course, as long as no conforming has been made, the clips are marked as pending clips without thumbnail preview. By repeating the described steps above you can add as many EDLs to your project as you want.



EDL added to the bin

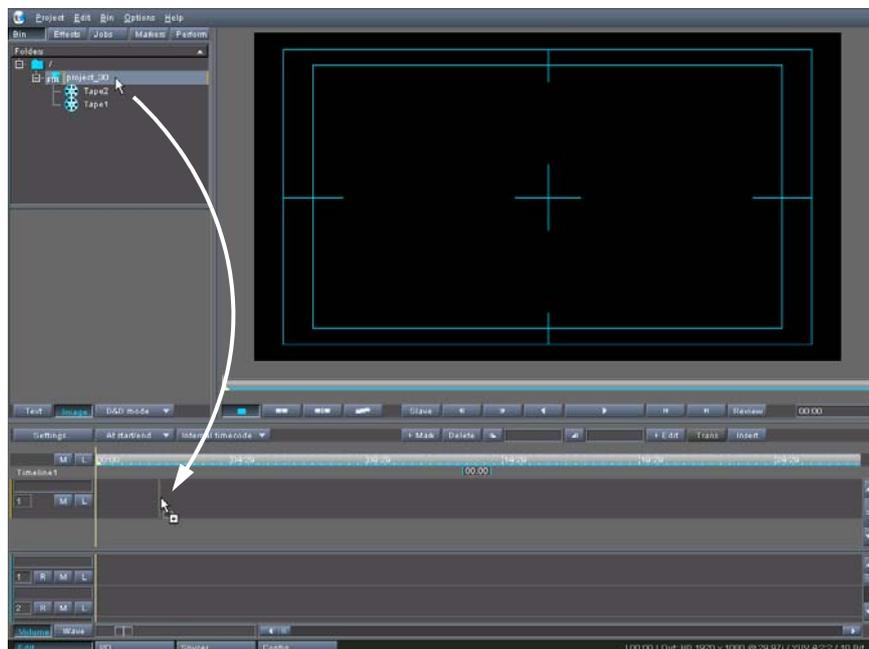
Once an EDL is available in the bin, you can start a conforming process at any time (see section “Conforming”), build up a time-line of the EDL in the Edit Tool (see section “Building up a Time-line”) or process it further with the conforming mode of the Edit Tool

## Building up a Timeline

Normally, the goal of a conforming process is to have a timeline of the imported EDL properly conformed in the timeline tracks of the Edit Tool, ready for further processing. For this you have to build up a timeline of the EDL in the timeline area of the Edit Tool

Perform the following steps:

1. Select the EDL in the folder area of the bin and drag and drop it with the mouse into a video/audio track of the timeline area. It can be dropped anywhere you want.

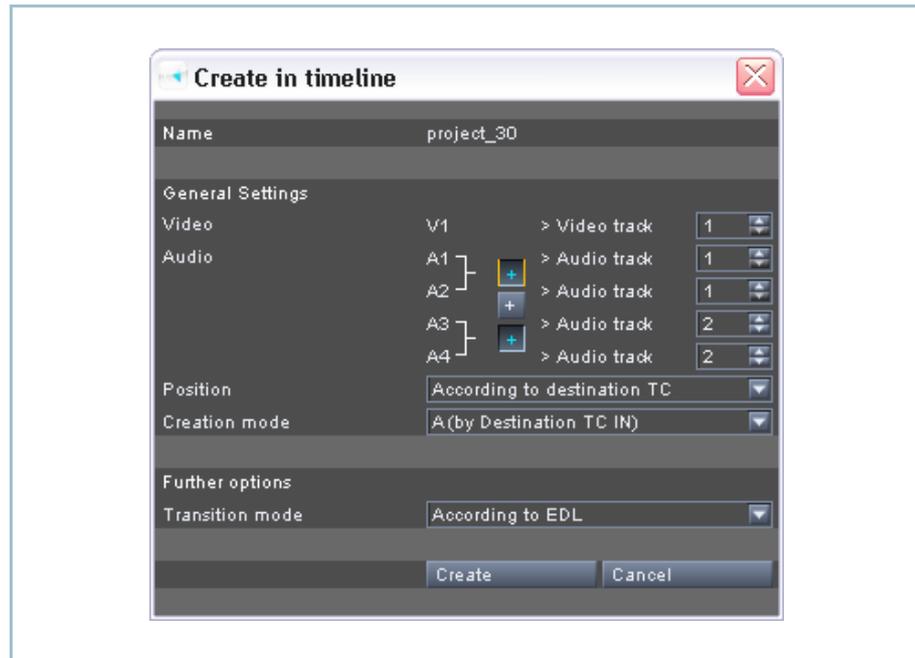




A timeline of the EDL can also be built up with the button **Create in TL...** of the conforming mode.

To build up an FCP XML file, you have to use one of its 'sequence' folders sorted under the main folder.

- ▶ When the mouse button is released, a window similar to the following will be displayed on the screen.



Dialog window to configure the EDL creation in the timeline



Creating an EDL twice in the timeline will duplicate it (in the bin and timeline). However, if the first created EDL exists only partially in the timeline, a dialog window appears beforehand asking you whether you want to duplicate the EDL or (re-)create the missing clips. By default newly added clips/EDLs will be added for video in the next higher video track (> no. 1), and for audio in the lowest audio tracks (> no. 16). Anyhow, this can be adjusted freely with the settings items described below.

2. This window allows you to configure the creation of the EDL in the timeline. It provides the following settings items:

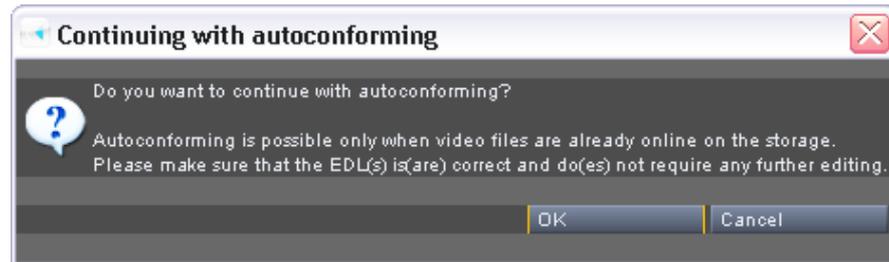
Item	Description
<b>Name</b>	This field shows you the name of the EDL as it is available in the bin.
<b>Video</b>	Determines in which video track to add the video stream of the EDL. With only one video stream available the video track can be selected freely with the entry field to the right.
<b>Audio</b>	<p>Determines in which audio track to add the audio of the EDL. To the left the possible audio streams of an EDL are detailed (A&lt;x&gt;). These can be assigned to audio tracks of the CLIPSTER with the entry fields to the right.</p> <p>An activated <b>+</b> button between two audio streams configures them to stereo. Then, when these streams are detailed for an audio clip in the EDL, a stereo clip will be created in the assigned audio track. Only neighboring streams can be configured to stereo. A deactivated <b>+</b> button will create mono clips.</p> <p>The configured stereo/mono streams have to be assigned to different audio tracks of the timeline. Hence, with the entry fields to the right only unassigned tracks can be selected.</p> <p> What is created in the timeline must be seen in relation to the EDL: An audio stream that is not specified in the EDL will not be created in the timeline.</p>
<b>Position</b>	Specifies the position where to add the clips of the EDL to the timeline. For example, they can be placed at the current position of the timeline cursor, at the end of the timeline, at their source positions determined by the source in- and outpoints of the EDL, or at their destination positions.



Item	Description
<p><b>Creation mode</b></p>	<p>Configures the way the EDL will be created in the timeline. It can be created either in A-mode or in C-mode.</p> <p>In A-mode the clips of the EDL will be created in the timeline in the sequence of their destination positions as detailed in the file.</p> <p>In C-mode the clips of the EDL will be created in the timeline in ascending order sorted by reel names and source inpoints. This may be useful, for example, when you want to record the clips of the EDL with a linear device such as a VTR (e.g. for archiving) or color correct the clips more efficiently, based on the time of the shot (i.e. on daylight changes).</p> <p> The timeline can provide an EDL in C-mode and A-mode at the same time. Just build up the same EDL twice in the timeline in different tracks and with different modes.</p> <p>Any effects settings made for an EDL in C-mode can also be received for the EDL in A-mode: By reconforming the edited EDL with a duplicate of the EDL or with its original EDL file and then creating this EDL in the timeline in A-mode, the effects settings should be available in A-mode as well (if set up correctly and the clips provide different durations).</p>
<p><b>Transition mode</b></p>	<p>Determines the way transitions will be created in the timeline. It enables you to replace transitions detailed in the EDL with hard cuts.</p>

3. Configure the list to be created in the timeline appropriately.

4. Once everything is set confirm your settings with the **OK** button.
  - ▶ This will start the creation process and a progress bar may inform you about its status. When finished, the clips of the EDL will be available in the timeline of the Edit Tool. If an EDL with unconformed events has been added to the timeline, you will be asked whether you want to perform an autoconforming immediately:



- ▶ Then you can start the conforming process right away by confirming the message with the **OK** button.

Alternatively, if you want to configure the EDL beforehand or record the clips of the EDL from a connected external player, you can skip the automatic conforming with the button **CANCEL**. Then you can process the EDL either in the timeline directly or use the conforming mode of the CLIPSTER for further adjustments.



## Conforming

This section describes the conforming procedure, step by step.

The following topics are covered:

- Starting the Autoconforming (page 474)
- Conforming an EDL Manually (page 474)
- Conforming an EDL Automatically after its Build-up in the Timeline (page 475)
- Configuring the Autoconforming (page 476)

### Starting the Autoconforming

As soon as an EDL is available in the CLIPSTER, it can be conformed. There are several ways to start an autoconforming:

- An autoconforming can be started manually, for example, with the controls of the conforming mode of the CLIPSTER.
- An autoconforming can be performed automatically right after the build-up of an EDL in the timeline.



For an autoconforming the video/audio data must be already available as files on a storage.

There are other possibilities at your disposal to conform an EDL, such as the capturing of the required data from an externally connected player.

### Conforming an EDL Manually

As soon as an EDL is available in the Edit Tool the conforming process can be started at any time with the conforming mode of the control area.



This way to start an autoconforming can always be used, meaning it can be used for conformed/unconformed EDLs or EDLs already built up in the timeline.

The following can also be performed via the menu option **Autoconform...** on the context menu of an EDL in the timeline.

Perform the following steps:

1. Activate the conforming mode with its respective button of the control area's controls
2. If not already selected select the EDL either in the bin or on the tab **EDLs** of the work area of the conforming mode.
3. Then press from the controls of the conforming mode the button **AUTOCONFORM...**

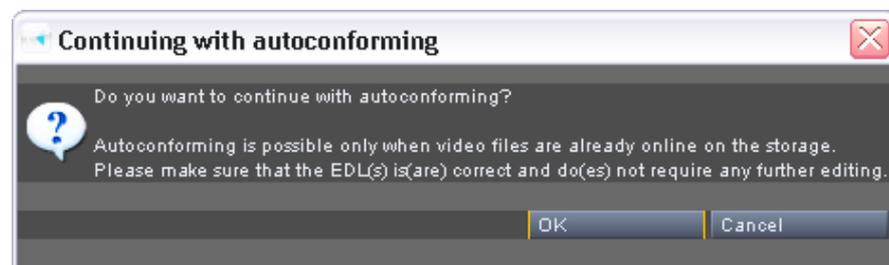
After this the window to configure the autoconforming will be displayed on the screen.

## Conforming an EDL Automatically after its Build-up in the Timeline

When an EDL with unconformed events is built up in the timeline, an autoconforming can be performed immediately afterwards.

Perform the following steps:

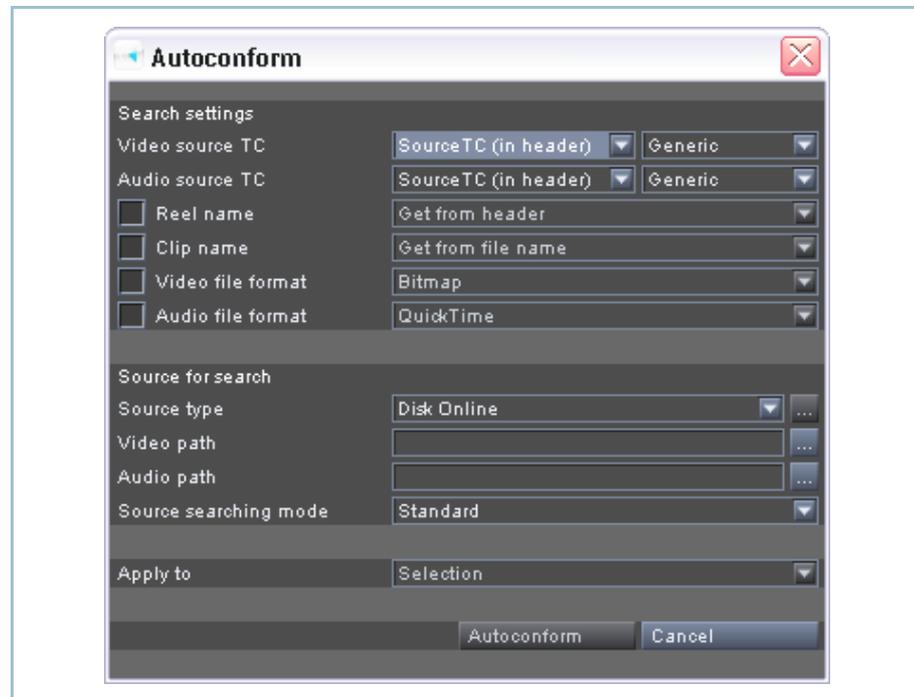
- Click the **OK** button in the message window that will be displayed after an EDL is built up in the timeline



After this the window to configure the autoconforming will be displayed on the screen.

## Configuring the Autoconforming

After starting the autoconforming process the window to configure the conforming will be displayed on the screen:



Configuring the autoconforming

### Video source TC

Determines how to perform a search for the video clips of the EDL. For an autoconforming you can select between Source TC (in header), Keycode (in header) and File number as TC.

The first two settings should be used if the headers of the video files on the storage provide source timecode or keycode information. If Source TC is selected, you can select the type of timecode that should be used for the search with the combo box to the right. Then, if the header data of a found video clip matches a source in-/outpoint stated in the EDL, the respective EDL clip will be appropriately linked.

The Edge code & Time of Day setting searches in both header fields. If one matches, the respective clip will be linked.



	<p>The <code>File number as TC</code> setting should be used if timecodes of the original source were used for the numbering of the image files. With this setting the timecode information stated in the EDL (source in- and outpoints) will be translated into frames with the frequency set for the EDL. Afterwards these numbers will be searched for in the file names. If matching frame numbers are found within a video clip (in- as well as outpoint), the respective EDL clip will be appropriately linked.</p>
<b>Audio source TC</b>	<p>Determines how to perform a search for audio material of the EDL. For an autoconforming you can select between <code>Source TC (in header)</code> and <code>Sample count</code>.</p> <p>The source timecode setting should be used if the headers of the audio files on the storage provide source timecode information. You can select the type of timecode that should be used for the search with the combo box to the right. Then, if the source data stated in the EDL matches the header data of a found audio clip and when the duration of the audio clip is sufficient, the respective EDL clip will be appropriately linked.</p> <p>The <code>Edge code &amp; Time of Day</code> setting searches in both header fields. If one matches and the duration is sufficient, the respective clip will be linked.</p> <p>With the <code>Sample count</code> setting selected, the audio clips will be linked if their duration comprises the source outpoint of the audio event.</p>
<b>Reel name</b>	<p>Narrows down your search (AND search). Searches for the reel name as it was determined during import of the EDL either, for example, in the files' header data, in the directory path where the found clip is stored or in its file name prefix.</p>



<b>Clip name</b>	Narrows down your search (AND search). Searches for the clip name as it was determined during import of the EDL either, for example, in the directory path where the found clip is stored or in its file name prefix.
<b>Video file format</b>	Narrows down your search (AND search). Allows you to select the file format of the video clips that should be found only
<b>Audio file format</b>	Narrows down your search (AND search). Allows you to select the file format of the audio clips that should be found only
<b>Source type</b>	<p>Sets the source/search type. You can choose between <b>Disk Online</b>, <b>SpycerNet</b> and <b>VTR-TL</b>.</p> <p>The <b>Disk Online</b> setting searches for the clips on the local storage in the specified locations (<b>Video path</b> and <b>Audio path</b>) including all subdirectories.</p> <p>The setting <b>SpycerNet</b> utilizes the SpycerNet to search for clips. Its main advantage is that you can include remote systems in your search, but it may also be helpful during local searches, especially when large amounts of data should be searched through (faster search). Once this setting is selected, the button to the right of the combo box <b>Source type</b> will be available. With it you can select hosts and directories in the SpycerNet that should be searched for the clips (including all subdirectories).</p> <p>With the setting <b>VTR-TL</b> you can select a VTR timeline project for the conforming (see the I/O Tool user guide), i.e. the clips on the 24-hours timeline of the selected VTR project (<b>Video path</b> and <b>Audio path</b>) will be used.</p>

<b>Video path</b>	Available for <code>Disk Online</code> and <code>VTR-TL</code> : Determines where to search for video clips. Either enter a directory path directly or use the button to the right to select the location. Several locations can be specified by separating them with an asterisk (e.g. <code>E:/dir_1*F:/dir_2</code> ). With <code>VTR-TL</code> selected, this entry must point to a VTR timeline project file ( <code>*.cp</code> , the same that is set for audio).
<b>Audio path</b>	Same as <b>Video path</b> but determines where to search for audio clips.
<b>Source searching mode</b>	Sets the mode that should be used for the search. You can select between different search modes:  Standard is the fastest search mode available because it uses an efficient algorithm. However, under rare circumstances it may not be able to find the correct clips.  If the standard search does not yield the expected results, you can use an Intensive search. It will look through the found files one by one and thus takes considerably longer.
<b>Apply to</b>	This setting allows you to limit the procedure. You can perform it either on all clips of an EDL or on a selection of reels/clips. A selection can be specified either when the EDL is available in the timeline or in the conforming mode.

In this window configure the autoconforming according to the material to be conformed. Once everything is set start the autoconforming with the button **Autoconform**.

This will start the conforming process and a progress bar will inform you about its status. When finished, you may receive log messages informing you about the success of the conforming.

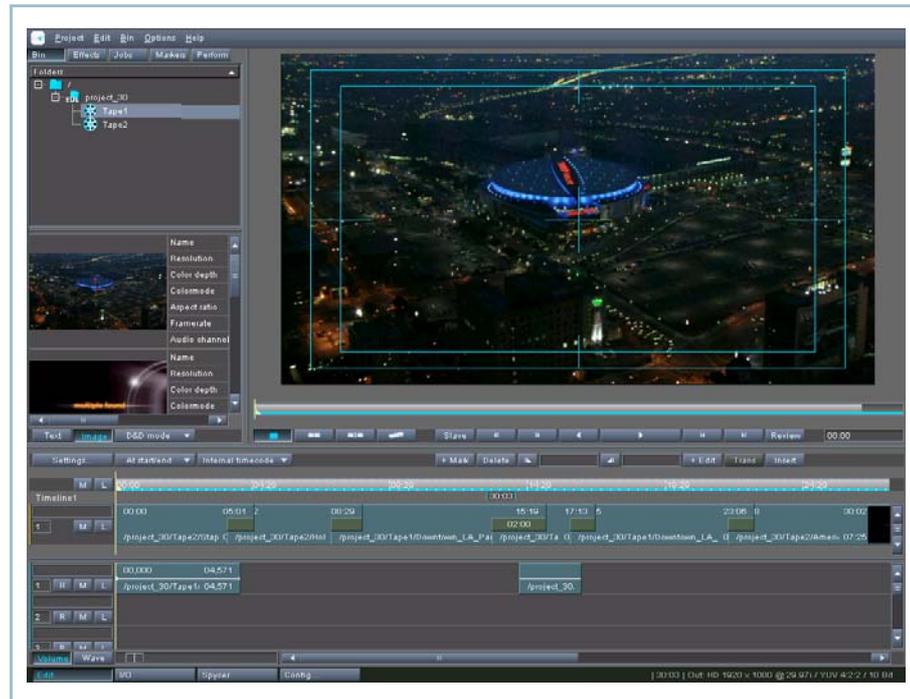


Speed effects that an EDL may provide will also be observed. They will be translated into time stretching or time compression for clips in the timeline.

## Working with EDLs from the Timeline

As soon as an EDL is available in the timeline you can use the Edit Tool as usual and work with its clips on the timeline. Furthermore, if a conforming has been performed already, you can evaluate and process its result directly in the timeline.

With the edit mode of the control area activated the clips of an EDL are displayed as standard timeline clips:



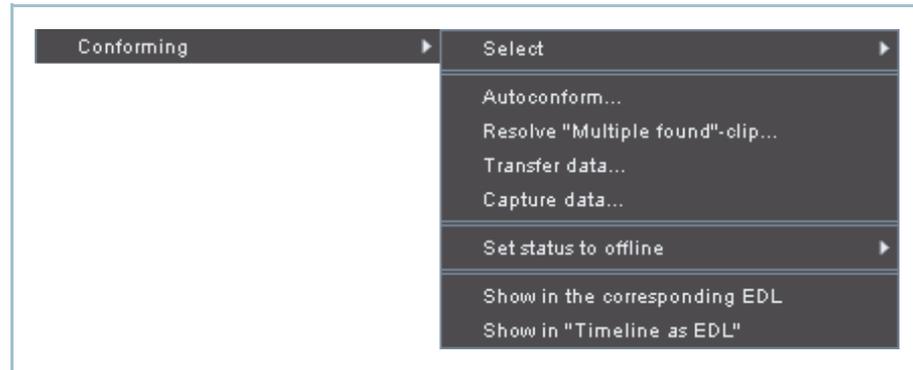
Conformed EDL in timeline (edit mode)

By stepping through the timeline, for example, or by playing it out, you can immediately see where the EDL clips require adjustment (such as multiple or not found clips, see section “Evaluation and Further Processing of the Conforming” on page 8-19).

The following describes the possibilities that are available for EDLs in the timeline. All can be found on the context menu of a clip in the timeline under the menu option **Conforming**.



By changing in-/outpoints of clips from an EDL in the timeline (trimming) you change the destination in-/outpoints of the EDL. To change source in-/outpoints, you have to use the conforming mode.



Conforming functions provided in the timeline

<b>Select</b>	With this menu option you can choose between different methods to select clips on the timeline. For example, the option <b>All "online RT" clips</b> selects all clips on the timeline that have the status 'Online RT'.
<b>Autoconform...</b>	Performs the same operation as the button <b>AUTOCONFORM...</b> of the conforming mode.
<b>Resolve "Multiple found"-clip...</b>	If not already visible, this menu option switches to the conforming mode of the control area and displays in the preview area the clips that were found for this EDL entry. Then you can assign one of the found clips to this EDL entry and thus resolve its state.
<b>Transfer data...</b>	Starts the process to transfer data from a non-real-time capable storage (e.g. on a remote system) to the main storage of the system.
<b>Capture data...</b>	Starts the process to capture data.
<b>Set status to offline</b>	With this menu option you can select the range of clips that should be set to the status 'Offline', i.e. whether only the currently selected clip(s) or all should be set to offline.



<p><b>Show in the corresponding EDL</b></p>	<p>If not already visible, this menu option switches to the conforming mode of the control area, selects the appropriate EDL and displays it on the tab <b>EDL Clips</b>. The entries of the clips that were selected when this menu option was called will be highlighted in the table. It can be used on clips of the same EDL only.</p>
<p><b>Show in "Timeline as EDL"</b></p>	<p>If not already visible, this menu option switches to the conforming mode of the control area, selects the 'Timeline as EDL' view and displays it on the tab <b>EDL Clips</b>. The entries of the clips that were selected when this menu option was called will be highlighted in the table.</p>

## The Conforming Mode - Overview

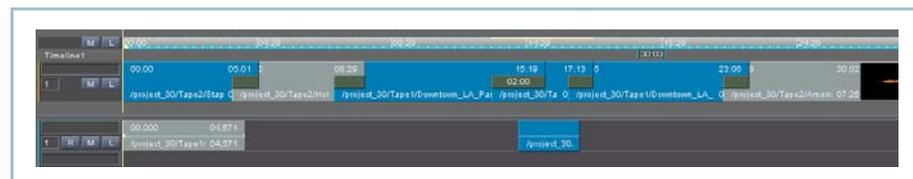
All tasks that have been described so far in this chapter can also be performed directly with the conforming mode of the Edit Tool. With it you can, for instance, import EDLs, build them up in the timeline or autoconform them. Furthermore, already conformed EDLs can be evaluated and processed further.

The conforming mode can be activated with its respective button from the controls in the control area of the Edit Tool. The control area will then switch to the conforming mode:



Conforming mode overview

If a conformed EDL is already available in the timeline, its clips will be especially color coded.



Conformed EDL in timeline (conforming mode)

With this you can grasp the status of a conforming immediately:

<b>standard clip color</b>	The clip does not belong to an EDL. It is a normal clip available in one of the standard folders of the bin.
----------------------------	--



blue	The clip is already conformed and linked to data on a storage.
grey	The clip is unconformed either because a conforming has not been made yet, no matching clips could be found or there are multiple search results available.

A clip that was conformed with material from a non-real-time capable storage will be marked in the timeline for a prerendering. However, a prerendering of such clips (i.e. status 'Online NRT') cannot be performed. Instead such a status should be resolved by copying the material of these clips to the local storage.

In the conforming mode you can work on the timeline as usual. During editing the clips of the EDL in the timeline will stay linked to the EDL visible in the bin and work area of the conforming mode. All changes to the timeline will be reflected either in the 'Timeline as EDL' view or in the EDL directly. When in- or outpoint values are changed, they will be displayed on the tab **EDL Clips** in orange.

	Source in- and outpoints can be altered, for example, in the work area directly, while destination values can be changed by trimming the clips of a built-up EDL in the timeline.
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Additionally, you can review the result of your work on the timeline/EDL easily in the preview area of the conforming mode. It can be switched between a view of the timeline or the selected EDL.



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# Appendix

This chapter provides further information about the Edit Tool

It is divided into following sections:

- Keyboard Shortcuts (page 486)
- Supported File Formats (page 491)
- Supported File Formats for Watermarking (page 499)
- Supported Video Rasters (page 503)
- 1D LUT Files (page 507)
- 3D LUT Files (page 509)
- Slave Mode / RS-422 Control (page 514)



## Keyboard Shortcuts

For a more easy and a faster control of the CLIPSTER there are various keyboard shortcuts available as listed below:

Action	Shortcut
Play (speed 1)	[Space], [5]
Stop (speed 0)	[Space], [K], [Shift + K]
Start playout from inpoint	[6]
Increase speed by 1 (speed will be indicated in fps in play button)	[L]
Increase speed by 0.1 (speed will be indicated in fps in play button)	[Shift + L]
Decrease speed by 1 (speed will be indicated in fps in play button)	[J]
Decrease speed by 0.1 (speed will be indicated in fps in play button)	[Shift + J]
Step one (1) frame forward	[Right Arrow], [4]
Step one (1) frame backward	[Left Arrow], [3]
Step ten (10) frames forward	[Shift + Right Arrow], [2]
Step ten (10) frames backward	[Shift + Left Arrow], [1]
Jump to project begin	[Pos 1]
Jump to project end	[End]
Go to next cutting point	[Ctrl + Right Arrow], [S]
Go to previous cutting point	[Ctrl + Left Arrow], [A]
Activate insert mode	[;]
Activate overwrite mode	[']
Slip by one (1) frame forward (no in-/outpoint is selected)	[.]
Trim by one (1) frame forward (when in-/outpoint is selected)	[.]
Slip by one (1) frame backward (no in-/outpoint is selected)	[,]
Trim by one (1) frame backward (when in-/outpoint is selected)	[,]



Action	Shortcut
Slip by ten (10) frames forward (no in-/outpoint is selected)	[/]
Trim by ten (10) frames forward (when in-/outpoint is selected)	
Slip by ten (10) frames backward (no in-/outpoint is selected)	[M]
Trim by ten (10) frames backward (when in-/outpoint is selected)	
Move by one (1) frame forward	[Shift + .]
Move by one (1) frame backward	[Shift + ,]
Move by ten (10) frames forward	[Shift + /]
Move by ten (10) frames backward	[Shift + M]
Select clip's inpoint	[Y]
Select clip's outpoint	[U]
Select clip's in- and outpoint (when one or more clips are selected)	[[]]
Activate trim mode (when no clip is selected)	[[]]
Select clip's in- and outpoint	[Shift + []]
Activate trim mode and select clip's inpoint	[Ctrl + []]
Activate trim mode and select clip's outpoint	[Alt + []]
Add edit/cutting point	[Shift + H]
Delete selected clip(s) in the timeline in overwrite mode (lift)	[Z]
Delete selected clip(s) in the timeline in insert mode (extract)	[X]
Set timeline inpoint	[E], [I]
Set timeline outpoint	[R], [O]
Set timeline in- and outpoint at the cutting points of the current clip	[T]
Delete timeline inpoint	[D]
Delete timeline outpoint	[F]



Action	Shortcut
Delete timeline in- and outpoint	[G]
Go to timeline inpoint	[Q]
Go to timeline outpoint	[W]
Add timeline marker	[Shift + N]
Zoom into timeline	[Up Arrow]
Zoom out of timeline	[Down Arrow]
Mute on/off video track #1	[8]
Mute on/off video track #2	[7]
Mute on/off audio track #1	[9]
Mute on/off audio track #2	[0]
Mute on/off audio track #3	[-]
Mute on/off audio track #4	[=]
Lock on/off video track #1	[Ctrl + 8]
Lock on/off video track #2	[Ctrl + 7]
Lock on/off audio track #1	[Ctrl + 9]
Lock on/off audio track #2	[Ctrl + 0]
Lock on/off audio track #3	[Ctrl + -]
Lock on/off audio track #4	[Ctrl + =]
Enter double-zero (00) in timecode fields	[.] (numeric keypad)
Deactivate snapping mode	Hold [Shift] key while working in the timeline with the mouse
Slave mode on/off	[Alt + S]
Select several clips and/or transitions disjointedly	Hold [Ctrl] key while selecting clips/transitions with the mouse
Select a range of adjoining clips and/or transitions	Hold [Shift] key while selecting clips/transitions with the mouse



Action	Shortcut
Copy bin clip to a folder of the bin instead of moving	Hold [Ctrl] key while drag and drop of clip with mouse
Invert the selection in the bin	[Ctrl + I]



## Keyboard Shortcuts for 3D

Action	Shortcut
Slip left eye one (1) frame forward	[Ctrl + .]
Slip left eye one (1) frame backward	[Ctrl + ,]
Slip left eye ten (10) frames forward	[Ctrl + /]
Slip left eye ten (10) frames backward	[Ctrl + M]
Slip right eye one (1) frame forward	[Alt + .]
Slip right eye one (1) frame backward	[Alt + ,]
Slip right eye ten (10) frames forward	[Alt + /]
Slip right eye ten (10) frames backward	[Alt + M]
Merge/unmerge 3D stereo tracks (when such tracks have been created)	[Shift + E]
Toggle between left/right eye in <b>Single stream</b> mode (does not affect the output)	[Shift + W]
Activate <b>Single stream</b> output mode for left eye	[Shift + A]
Activate <b>Single stream</b> output mode for right eye	[Shift + S]
Activate <b>Dual stream</b> output mode	[Shift + D]

## Supported File Formats

The R&S DVS software supports over 100 graphics and image file formats. Most are made available by a special library.

The tables in the following list the file formats that are supported by the R&S DVS software directly. Some are video or audio-only file formats and some are container file formats that contain audio as well as video. They are listed accordingly in this section.



Some of the file formats:

- may belong to optional packages
- may not be real-time capable
- cannot be captured
- may require the installation of third-party programs (e.g. \*.mov)

The supported file formats are presented as follows:

- Video Only File Formats (page 491)
- Container File Formats (page 494)
- Audio-only File Formats (page 498)

### Video Only File Formats

Format Name	Default Extension	File storage format	Description
ARRI raw	*.ari	12 bit raw (uncompressed)	Raw 12 bit file formats developed by the ARRI Group for on-camera recordings. Available for loading only.
BMP	*.bmp	3 × 8 bit RGB and 4 × 8 bit RGBA	8 bit RGB file format with or without key. Windows bitmap format.
Cineon <sup>1</sup>	*.cin	3 × 10 bit RGB	10 bit RGB format. Subset of the ANSI/SMPTE DPX file format. Flexible file format by Kodak, allowing for variable image headers.



Format Name	Default Extension	File storage format	Description
DPX<Superscript> <sup>1,2</sup>	*.dpx	8/10 bit YUV 4:2:2 and YUVA 4:2:2:4	8 or 10 bit YUV file format with or without key. SMPTE Standard File Format for digital moving-picture exchange.
		3 × 8/10 bit RGB and 4 × 8/10 bit RGBA	8 or 10 bit RGB file format with or without key. SMPTE Standard File Format for digital moving-picture exchange.
		3 × 12/16 bit RGB	12 or 16 bit RGB file format. SMPTE Standard File Format for digital moving-picture exchange.
JPEG2000 <sup>3</sup>	*.j2k *.jpc	8/10 bit YUV 4:2:2	8 or 10 bit YUV file format. Flexible data and still image compression standard, operating either compressed or uncompressed.
		3 × 10/12 bit RGB	10 or 12 bit RGB file format. Flexible data and still image compression standard, operating either compressed or uncompressed.
		3 × 12 bit XYZ	12 bit XYZ file format. Flexible data and still image compression standard, operating either compressed or uncompressed.
OpenEXR <sup>4</sup>	*.exr	3 × 16 bit RGB and 4 × 16 bit RGBA	16 bit RGB high dynamic range file format with or without key, operating either compressed or uncompressed. For reading, various other (color) channels are supported as well.
SGI <sup>5</sup>	*.sgi *.rgb	3 × 8/16 bit RGB	8 or 16 bit RGB file format. SGI IRIX image format.
Targa	*.tga	3 × 8 bit RGB, 4 × 8 bit RGBA and 8 bit Luma	Targa image format in 8 bit Luma or RGB with or without key.



Format Name	Default Extension	File storage format	Description
TIFF	*.tif *.tiff	3 × 8/12/16 bit RGB, 4 × 8/12/16 bit RGBA and 8/12/16 bit Luma	TIFF or Tagged Image File Format in 8, 12 or 16 bit Luma or RGB with or without key. Highly flexible and platform-independent image format. Not all variants of this format are supported.
YUV	*.qnt *.qt1 *.yuv *.yuv8	8 bit YUV 4:2:2 and YUVA 4:2:2:4	Raw 8 bit YUV file format with or without key. <sup>6</sup> This file has no header. The image format is recognized by the file size. This is done with a table of predefined file sizes. Component order UYVY.
	*.yuv1 0	10 bit YUV 4:2:2 and YUVA 4:2:2:4	Raw 10 bit YUV file format with or without key. This file has no header. The image format is recognized by the file size. This is done with a table of predefined file sizes. Component order UYVY. Bits are packed tightly from left to right for three component samples, then two bits of padding (zero) to fill up to four bytes. The lines are padded to a multiple of four bytes. The file is padded to a multiple of 512 bytes.
	*.yuv1 6	16 bit YUV 4:2:2	Raw 16 bit YUV file format. <sup>7</sup> This file has no header. The image format is recognized by the file size. This is done with a table of predefined file sizes. Each component is stored as a 16 bit value in big-endian byte order (left-aligned). Component order UYVY.

1.DVS saves files of this format by default in big-endian byte order. However, during loading both formats (little- and big-endian byte order) can be read.

2.Regarding the file type: V2 is the DPX file format according to SMPTE 268M-2003, the remaining (V1) are SMPTE 268M-1994. 'b.e.' stands for big endian, 'l.e.' for little endian.

3.Capturing depends on system power, output resolution and color space. Capturing in VTR mode requires an edit lag of 14 frames or more.

4.Cannot be captured.

5.Not real-time capable. A finalizing can only be performed uncompressed. Cannot be captured.

6.8 bit YUV 4:2:2 and YUVA 4:2:2:4: 8 bit per component, 16 bit average per pixel.

7.16 bit YUV 4:2:2: 16 bit per component, 32 bit average per pixel.



## Container File Formats

Format Name	Default Extension	File storage format	Description
AVI <sup>1</sup>	*.avi	3 × 8 bit RGB (either compressed or uncompressed + audio)	Video file format that supports various file storage formats, either compressed or uncompressed. Proprietary streaming video technology developed by Microsoft. Only QuickTime and CineForm codecs are supported.
H.264	*.mts	3 × 8 bit RGB or 8 bit YUV (compressed and/or audio)	Compression format for video and audio capable of providing good video quality (e.g. when in HD) at lower bit rates. One of the standard codecs for Blu-ray Discs.
MPEG-1 <sup>2</sup> MPEG-2<Superscript>2	*.mpg *.mts *.m2ts *.ts	3 × 8 bit RGB or 8 bit YUV (compressed + audio)	File format for the compression of video and audio.
MPEG-4<Superscript>2	*.mp4	3 × 8 bit RGB or 8 bit YUV (compressed and/or audio)	File format for the compression of video and audio as well as other media types. Based on the QuickTime file format.
Phantom Cine Raw<Superscript>1	*.cine	Raw (uncompressed)	Raw video-only file format developed by Vision Research for an on-camera recording.
QuickTime	*.mov *.avi<Superscript>1	Various (e.g. RGB or YUV either compressed or uncompressed + audio)	Video file format that supports various file storage formats, either compressed or uncompressed, incl. e.g. CineForm<Superscript>1 or ProRes. Proprietary streaming video technology developed by Apple. For finalizing the available file types depend on whether <b>Hardware finalize support</b> is activated or deactivated. 2K resolutions or above are supported when <b>File type</b> is not set to QuickTime Conversion.

Format Name	Default Extension	File storage format	Description
RED-CODE<Superscript> <sup>1</sup>	*.r3d	12 bit raw (wavelet compressed + audio)	Raw 12 bit file format for the compression of video at a variable bit rate. Developed by RED Digital Cinema Camera Company for an on-camera recording.
Windows Media <sup>3</sup>	*.wmv	3 × 8 bit RGB (compressed + audio)	Video file format that supports various file storage formats. Proprietary streaming video technology developed by Microsoft. Only compressed variants are supported.

1.Available for loading only.

2.A finalizing can only be performed compressed. Cannot be captured.

3.Available for finalizing only.

Furthermore, the software supports different variants of MXF (e.g. MXF OP-Atom, MXF OP-1a and P2; extension \*.mxf) as well as DV (DIF; extension \*.dv) files. Both are container formats for audio and/or video material. They are implemented with the following compression codecs:



Please note that the following list is not complete. Other codecs may be available and other video rasters, bit rates, number of audio channels etc. may work as well.



Codec	Video Raster <sup>1</sup>	Video Bit Rates	Audio Bit Depth and Channels <sup>2</sup>	Format
AVC-Intra	720p /50/59.94, 1080i /23.98/25 (4:2:0), 1080p /23.98/25/29.97 (4:2:0)	50	16 bit: 0, 2, 4, 8 (MXF (P2)) 16/24 bit: 0, 2, 4, 6, 8, 10, 12, 14, 16 (MXF OP-Atom)	MXF (P2), MXF OP- Atom
	720p /23.98/25/29.97/50 /59.94, 1080i /25/29.97, 1080p /23.98/25/29.97	100		
	720p /23.98/25/29.97/50 /59.94, 1080p /23.98/25/29.97 /50/59.94, 1080i /23.98 <sup>3</sup> /25/29.97 /50/59.94p	200		
DV25	525i /29.97 (4:1:1), 625i /25 (4:2:0)	25	16 bit: 0, 2	MXF (P2), MXF OP- Atom, DV (DIF)
DVCPRO 25	525i /29.97, 625i /25, all in 4:1:1	25	16 bit: 0, 2, 4, 8 (MXF), 0-2 (DV)	MXF (P2), MXF OP- Atom, DV (DIF)
DVCPRO 50	525i /29.97, 625i /25	50	16 bit: 0, 2, 4, 8 (MXF), 0-4 (DV)	MXF (P2), MXF OP- Atom, DV (DIF)
DVCPRO HD	720p /50/59.94, 1080i /25/29.97	100	16 bit: 0, 2, 4, 8 (MXF), 0-8 (DV)	MXF (P2), MXF OP- Atom, DV (DIF)



Codec	Video Raster <sup>1</sup>	Video Bit Rates	Audio Bit Depth and Channels <sup>2</sup>	Format
DNxHD	1080p /23.98/24/25	36	16 bit: 0-16	MXF OP-Atom  Each audio channel will be recorded in a separate file. Recording 16 audio channels will generate 16 individual MXF files for audio (mono).
	1080p /29.97	45		
	720p /23.98/25	60		
	720p /29.97	75		
	720p /23.98/25, also in 10 bit	90		
	720p /29.97, also in 10 bit	110		
	720p /50, 1080p /23.98/24	115		
	720p /50 1080i, p /25	120		
	720p /59.94, 1080i, p /29.97	145		
	1080p /23.98/24, also in 10 bit	175		
	720p /50, 1080i, p /25, all also in 10 bit	185		
	720p /59.94, 1080i, p /29.97, all also in 10 bit	220		
DNxHD 444	1080p (4:4:4, 10 bit)	440		
HDCAM SR Lite <sup>4</sup>	1080i /50/59.94, 1080p /23.976/24/25 /29.97, 720p /50/59.94 all in 10 bit	220	24 bit: 0, 2, 4, 6, 8, 10, 12, 14, 16	MXF OP-1a
HDCAM SR SQ<Super-script>4	1080i /50/59.94, 1080p /23.976/24/25 /29.97, 720p /50/59.94 all in 10 bit and also in 4:4:4	440	24 bit: 0, 2, 4, 6, 8, 10, 12, 14, 16	MXF OP-1a



Codec	Video Raster <sup>1</sup>	Video Bit Rates	Audio Bit Depth and Channels <sup>2</sup>	Format
XDCAM IMX	525i /29.97, 625i /25	30, 40 or 50	16 bit: 0, 2, 4, 6, 8 24 bit: 0, 2, 4	MXF OP-1a
XDCAM HD	1080i /25/29.97 (4:2:0)	18, 25, 35	16 bit: 0, 2, 4	MXF OP-1a
	720p /50/59.94, 1080i, p /23.98/25/29.97	50	24 bit: 0, 2, 4, 8	
XDCAM DVC AM	525i /29.97 (4:1:1), 625i /25 (4:2:0)	25	16 bit: 0, 4	MXF OP-1a

1. If not mentioned otherwise all in 8 bit 4:2:2.

2. Observe the limitations as indicated: For example, for DVCAM either four (4) or no/zero (0) audio channels have to be selected. Furthermore, for all formats zero (0) audio channels can be selected. However, depending on the format, instead of no audio channels two muted ones may be created.

3. Only for MXF OP-1a.

4. Available for loading only.

## Audio-only File Formats

Format Name	Default Extension	Description
AIF AIFF	*.aif *.aiff	Audio interchange format. Platform-independent file format for sound. Capable of storing multiple mono or stereo channels.
BWF	*.rf64 *.wav	Broadcast wave format. Platform-independent file format for sound. Extension of the Wave format capable of storing multiple mono or stereo channels together with metadata and enabling file sizes of more than 4 GB.
Wave	*.wav	File format for digital audio (waveform) data under Windows. Capable of storing multiple mono or stereo channels.

## Supported File Formats for Watermarking

Table of supported file formats for watermarking (as of 5.10.0.0 version)

Video Standard	File Format
<b>QuickTime</b>	10 bit YUV422 (v210) ProRes 422 ProRes 422 (HQ) ProRes 422 (LT) ProRes 422 (Proxy) DV25 DV25 Avid DVCPro25 DVCPro50 DVCPro50 Avid DVCProHD100 DNxHD, 1080p, 10bit, 220Mbps DNxHD, 1080p, 8bit, 145Mbps DNxHD, 1080p, 8bit, 220Mbps DNxHD, 720p, 10bit, 185Mbps DNxHD, 720p, 8bit, 185Mbps DNxHD, 720p, 8bit, 120Mbps DNxHD, 1080i, 10bit, 220Mbps DNxHD, 1080i, 8bit, 145Mbps DNxHD, 1080i, 8bit, 220Mbps DNxHD, Thin, 8bit, 145Mbps DNxHD, 1080p, 8bit, 36Mbps IMX50 IMX50 Avid IMX40 IMX30 XDCamHD 25Mbps CBR 8Bit 4:2:0 XDCamHD 35Mbps VBR 8Bit 4:2:0 XDCamEX 35Mbps VBR 8Bit 4:2:0 XDCamHD 50Mbps CBR 8Bit 4:2:2 AVC-Intra50 AVC-Intra100
<b>DC MXF 250 (DCI)</b>	JPEG2000 12 bit XYZ JPEG2000 10 bit RGB JPEG2000 12 bit RGB MPEG2 VES



Table of supported file formats for watermarking (as of 5.10.0.0 version)

Video Standard	File Format
<b>XDCamIMX</b>	IMX50 IMX40 IMX30
<b>XDCamHD</b>	XDCamHD 50Mbps CBR 8Bit 4:2:2 XDCamHD 18Mbps VBR 8Bit 4:2:0 XDCamHD 25Mbps CBR 8Bit 4:2:0 XDCamHD 35Mbps VBR 8Bit 4:2:0
<b>DV</b>	DVCPro25 DVCPro50 DVCProHD100 DV25
<b>DC MXF 500</b>	JPEG2000 12 bit XYZ JPEG2000 10 bit RGB JPEG2000 12 bit RGB
<b>P2-Style MXF</b>	DV25 DVCPro25 DVCPro50 DVCProHD100 AVC-Intra50 AVC-Intra100 AVC-Intra200
<b>XDCamDV</b>	DV25

**Table of supported file formats for watermarking (as of 5.10.0.0 version)**

Video Standard	File Format
<b>MXF(OPAtom)</b>	DNxHD,1080p,10bit,220Mbps DNxHD,1080p,8bit,145Mbps DNxHD,1080p,8bit,220Mbps DNxHD,720p,10bit,185Mbps DNxHD,720p,8bit,185Mbps DNxHD,720p,8bit,120Mbps DNxHD,1080i,10bit,220Mbps DNxHD,1080i,8bit,145Mbps DNxHD,1080i,8bit,220Mbps DNxHD,1080p,8bit,36Mbps DNxHD,Thin,8bit,145Mbps DV25 DVCPro25 DVCPro50 DVCProHD100 XDCamHD 50Mbps CBR 8Bit 4:2:2 XDCamHD 35Mbps VBR 8Bit 4:2:0 XDCamHD 25Mbps CBR 8Bit 4:2:0 XDCamHD 18Mbps VBR 8Bit 4:2:0 XDCamEX 35Mbps VBR 8Bit 4:2:0 IMX50 IMX40 IMX30 AVC-Intra100 AVC-Intra50
<b>IMF / AS-02 MXF</b>	JPEG2000 10 bit RGB JPEG2000 12 bit RGB JPEG2000 8 bit YUV JPEG2000 10 bit YUV JPEG2000 12 bit XYZ
<b>IMF MXF (AS02)</b>	JPEG2000 10 bit RGB JPEG2000 12 bit RGB JPEG2000 8 bit YUV JPEG2000 10 bit YUV JPEG2000 12 bit XYZ



Table of supported file formats for watermarking (as of 5.10.0.0 version)

Video Standard	File Format
<b>MXF JPEG2000 LRCP</b>	JPEG2000 10 bit RGB JPEG2000 12 bit RGB JPEG2000 8 bit YUV JPEG2000 10 bit YUV JPEG2000 12 bit XYZ
<b>MXF AVCIntra</b>	AVC-Intra50 AVC-Intra100 AVC-Intra200
<b>AS-02 MXF</b>	JPEG2000 10 bit RGB JPEG2000 12 bit RGB JPEG2000 8 bit YUV JPEG2000 10 bit YUV JPEG2000 12 bit XYZ
<b>XAVC MXF</b>	XAVC HD Intra class 50 CBG XAVC HD Intra class 100 CBG XAVC 4K Intra class 100 CBG XAVC 4K Intra class 300 CBG XAVC 4K Intra class 480 CBG
<b>AS-11 MXF</b>	IMX50 AVC-Intra100



## Supported Video Rasters

Raster	Total lines per frame	x size	y size	Aspect ratio
525i /29.97 (NTSC)	525	720	486	4:3
625i /24 (Slow PAL) /25 (PAL)	625	720	576	4:3
525i /29.97 (NTSC HR)	525	960	486	16:9
625i /25 (PAL HR)	625	960	576	16:9
720p /23.976/24/25/29.97/30/50 /59.94/60/71.928/72	750	1280	720	16:9
1035i /29.97/30	1125	1920	1035	16:9
1080i /23.976/24/25/29.97/30	1125	1920	1080	16:9
1080p /23.976/24/25/29.97/30 /47.952/48/50/59.94/60	1125	1920	1080	16:9
1080psF /23.976/24/25/29.97/30	1125	1920	1080	16:9
2048p /23.976/24	1125	2048	1080	2:1
2048p /24	1600	2048	1536	4:3
2048p /24	1600	2048	1556	4:3
2048psF /23.976/24	1125	2048	1080	2:1
2048psF /24	1600	2048	1536	4:3
2048psF /14.985/15/19.98/20/24 /30/36	1600	2048	1556	4:3
3840p/23.976/24	2250	3840	2160	16:9
3996p /24	2200	3996	2160	16:9
3996p /24	2250	3996	2160	16:9
4096p /24	2200	4096	2160	16:9
4096psF /24	2200	4096	2160	16:9
4096p /23.976/24	2250	4096	2160	16:9
4096psF /5/23.976/24	3375	4096	3112	4:3



## RED EPIC Performance

The following tables show the performance of CLIPSTER with one (default) or two hardware accelerator boards installed when RED EPIC material is used.

### RED EPIC 2D payout

Source Material	Output Format	Bit Depth	1 Board	2 Boards
5120 × 2160	1920 × 1080 /24/25	8	✓	✓
	1920 × 1080 /30		✓	✓
5120 × 2560	1920 × 1080 /24/25	8	✓	✓
	1920 × 1080 /30		–	✓
5120 × 2700	1920 × 1080 /24/25	8	✓	✓
	1920 × 1080 /30		–	✓
5120 × 2160	1920 × 1080 /24/25	12	✓	✓
	1920 × 1080 /30		✓	✓
5120 × 2560	1920 × 1080 /24/25	12	✓	✓
	1920 × 1080 /30		–	✓
5120 × 2700	1920 × 1080 /24/25	12	✓	✓
	1920 × 1080 /30		–	✓
5120 × 2160	4096 × 2160 /24	8	✓	✓
	4096 × 2160 /25		✓	✓
5120 × 2560	4096 × 2160 /24	8	✓	✓
	4096 × 2160 /25		✓	✓
5120 × 2700	4096 × 2160 /24	8	✓	✓
	4096 × 2160 /25		✓	✓
5120 × 2160	4096 × 2160 /24	12	✓	✓
	4096 × 2160 /25		✓	✓
5120 × 2560	4096 × 2160 /24	12	✓	✓
	4096 × 2160 /25		–	✓
5120 × 2700	4096 × 2160 /24	12	✓	✓
	4096 × 2160 /25		–	✓

#### RED EPIC 3D payout

Source Material	Output Format	Bit Depth	1 Board	2 Boards
5120 × 2160	1920 × 1080 /24/25	8	–	✓
	1920 × 1080 /30		–	–
5120 × 2560	1920 × 1080 /24/25	8	–	✓
	1920 × 1080 /30		–	–
5120 × 2700	1920 × 1080 /24/25	8	–	✓
	1920 × 1080 /30		–	–
5120 × 2160	1920 × 1080 /24/25	12	–	✓
	1920 × 1080 /30		–	–
5120 × 2560	1920 × 1080 /24/25	12	–	✓
	1920 × 1080 /30		–	–
5120 × 2700	1920 × 1080 /24/25	12	–	✓
	1920 × 1080 /30		–	–

#### RED EPIC to 12 bit DPX finalize performance

Format	Source Material	Output Format	1 Board	2 Boards
<b>Autoscale 'off'</b>				
EPIC 2160 > 2K	5120 × 2160	2048 × 1080	~20 fps	~28 fps
EPIC 2160 > SD	5120 × 2160	720 × 480	~20 fps	~28 fps
EPIC 2560 > 4K	5120 × 2560	4096 × 2160	~16 fps	~24 fps
EPIC 2700 > 4K	5120 × 2700	4096 × 2160	~16 fps	~26 fps
<b>Autoscale 'fit'</b>				
EPIC 2160 > SD	5120 × 2160	720 × 480	~29 fps	~54 fps
EPIC 2160 > 2K	5120 × 2160	2048 × 1080	~29 fps	~42 fps
EPIC 2560 > 2K	5120 × 2560	2048 × 1080	~25 fps	~48 fps



**RED EPIC to 12 bit DPX finalize performance (Forts.)**

<b>Format</b>	<b>Source Material</b>	<b>Output Format</b>	<b>1 Board</b>	<b>2 Boards</b>
EPIC 2700 > HD	5120 × 2700	1920 × 1080	~25 fps	~47 fps
EPIC 2700 > 2K	5120 × 2700	2048 × 1080	~25 fps	~47 fps

## 1D LUT Files

A one-dimensional look-up table (1D LUT) file defines values for color and/or gamma correction. Depending on the color depth, for each input value the file specifies an output value for each color component and the alpha channel (key). It is a plain ASCII text file that has to match the following properties:

- Lines starting with a hash (#) are comments and will not be evaluated.
- There is a designated line (designated with the color depth) for the four color component values (RGBA). For example, for 10 bit video data the lines will start with zero (0) and end with 1023.
- Each designated line consists of four values (RGBA). The separation is made via tabulators ([TAB]).
- The LUT file has to provide  $1024 \times 5$  input/output values as used in 10 bit video mode. If you work with 8 bit video data, only every fourth value will be used from the LUT.
- The values have to be in ascending order.
- The color component values have to be stated as floating point values between zero (0) and one (1).

After some comments, for example, about the file and its values the file starts to list the color correction values. Each line starts with the designation of the input value (bit depth), succeeded by the four color component values: first blue, second green, then red, and last the alpha channel.

This leads to the following syntax:

```
# Any comment  
# Any comment  
<input value>      <B>      <G>      <R>      <A>
```

A finished and complete LUT file may look like the following (value pairs in the middle left out):



```
# Any comment
# Any comment
0      0.009766      0.000000      0.000000      0.0
1      0.011719      0.000000      0.000000      0.0
2      0.013672      0.000000      0.000000      0.0
3      0.015625      0.001953      0.000000      0.0
4      0.017578      0.003906      0.000000      0.0
5      0.019531      0.005859      0.000000      0.0
...
1022   0.999023      0.988281      0.999023      0.0
1023   0.999023      0.991211      0.999023      0.0
```

## 3D LUT Files

Three-dimensional look-up table (3D LUT) files are used for color corrections and/or color space conversions by defining output color values for input values. They are available in various formats, either encrypted (e.g. \*.e3d) or unencrypted (e.g. \*.3dl or \*.xml).

This section describes the unencrypted 3D LUT files:

- Understanding 3D LUT Files (page 509)
- 3DL Files (page 511)
- XML Files (page 512)

### Understanding 3D LUT Files

A 3D LUT file lists triplets of values for a color transformation. Depending on the color depth of the 3D LUT, each triplet of values (R'G'B') specifies the output values for a certain RGB node, i.e. the resulting mapped values of input values. The RGB nodes (input values) are not explicitly listed in a 3D LUT file. In a \*.3dl file they are available in the first uncommented line of the file and determine bit depth and number of nodes for the 3D LUT. In an \*.xml file these information are set as attributes of the 3D LUT tag.

The R&S DVS hardware can handle 17 nodes in a 3D LUT with an accuracy of 12 bit, meaning 17 nodes for R times 17 nodes for G times 17 nodes for B ( $17 \times 17 \times 17 = 17^3 = 4913$  R'G'B' values).

The nodes determine the RGB input values:



Nodes as, for example, listed in a \*.3dl file (17 nodes, 10 bit):

0 64 128 192 256 320 384 448 512 576 640 704 768 832 896 960

Resulting in the following RGB nodes:

# of node	R	G	B
1	0	0	0
2	0	0	64
3	0	0	128
...			
17	0	0	1023
18	0	64	0
19	0	64	64
20	0	64	128
...			
34	0	64	1023
35	0	128	0
36	0	128	64
...			
289	0	1023	1023
290	64	0	0
291	64	0	64
...			
4911	1023	1023	896
4912	1023	1023	960
4913	1023	1023	1023

For the  $17^3$  nodes  $17^3$  output R'G'B' values have to be set in the 3D LUT file. The first triplet describes the output value of the first node, the second triplet of the second node, and so on.

The numbers (lines) of an RGB node can be calculated with the following formula:

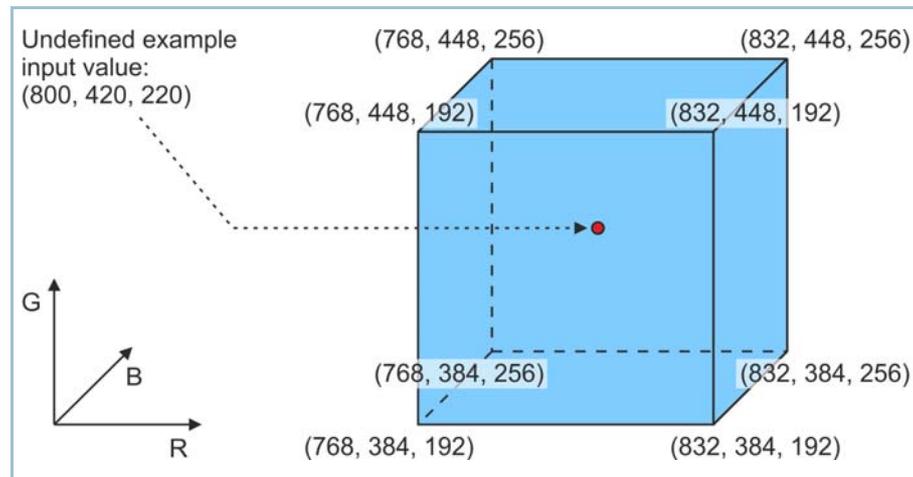
$$\# \text{ of node} = 17^2 \times \text{index}_R + 17 \times \text{index}_G + \text{index}_B + 1$$

[ indices range from zero (0) to 16 ]

Example for the node (768, 384, 192):

$$17^2 \times 12 + 17 \times 6 + 3 + 1 = 3574$$

In case a particular RGB value of an image's pixel is not directly described through a node, it has to be interpolated: The RGB nodes can be placed in a spatial graph (cube). Any input RGB value will be described by a set of surrounding RGB nodes:



Surrounding RGB nodes of an undefined input value

With the known look-up (output) values of these eight RGB nodes the required R'G'B' value can be calculated (interpolated).

### 3DL Files

A \*.3dl LUT file is a plain ASCII text file that has to match the following properties:

- Lines starting with a hash (#) are comments and will not be evaluated.
- The first uncommented line defines the input values (RGB nodes), i.e. the bit depth (e.g. if the end value is 1023, than 10 bit) and the number of nodes.
- All following lines provide the output values (R'G'B') for one RGB node.
- Each following line consists of three values (R'G'B'). The separation is made by spaces.
- You have to define all  $17^3 \times 3$  values and the triplets have to be in ascending order.
- The values have to be stated according to the bit depth between zero (0) and **<end value of RGB nodes>**.

After some comments, for example, about the file and its values the file starts with the input values. Then it lists the color correction values, leading to the following syntax:



```
# Any comment
# Any comment
<RGB nodes according to bit depth and # of nodes>
<R' of 1. node> <G' of 1.> <B' of 1.>
<R' of 2. node> <G' of 2.> <B' of 2.>
<R' of 3. node> <G' of 3.> <B' of 3.>
...
<R' of <# of nodes>3. node> <G' of <# of nodes>3.> <B' of <# of nodes>3.>
```

The following shows an example of a 3DL file (10 bit, value pairs in the middle left out):

```
# Any comment
# Any comment
0 64 128 192 256 320 384 448 512 576 640 704 768 832 896 960 1023
  27   25   23
  27   26   23
  34   35   39
  41   43   51
  56   59   75
  87   88  117
 117  126  192
 120  122  252
  43    0  280
  98    0  334
 134    0  375
 159    0  404
 171    0  423
...
1023  988  893
1023  989  893
1023  990  894
```

## XML Files

A 3D LUT \*.xml file is a plain ASCII text file that has to conform to the XML standard. It offers the following tags and attributes.

<LUT3D>	The root element/base tag that includes the other elements and tags. It should provide the following attributes:	
	name	The name of the 3D LUT file.
	N	The number of nodes, i.e. 17.
	BitDepth	The bit depth of the 3D LUT file.
<values>	Child element/tag that contains the R'G'B' output values for the RGB nodes. Each line consists of three values (R'G'B'). The separation is made by spaces. You have to define all $17^3 \times 3$ values and the triplets have to be in ascending order. The values have to be stated according to the bit depth.	

The following shows an example of a 3D LUT XML file (value pairs in the middle left out):

```
<LUT3D name='DVS Example 3D LUT' N='17' BitDepth='16'>
  <values>
    3113      0    2674
    3011      0    2341
    3055      0    2484
    2833      0    3307
    2721      0    4971
    3078      0    7032
    4249      0    9383
    5632      0   12272
    6910      0   15632
    7805      0   18808
    8417      0   21373
    8964      0   23256
    9366      0   24656
    ...
    65535 65395  57730
    65535 65378  57973
    65535 65368  58109
  </values>
</LUT3D>
```



## Slave Mode / RS-422 Control

For slave mode the R&S DVS system supports the RS-422 9-pin control protocol as well as a subset (major commands) of the Odetics® protocol. When acting as a master the system uses the RS-422 9-pin control protocol.

In case you want to control the R&S DVS system in slave mode via RS-422, the following specifications have to be set on the master device to ensure frame accurate editing.

<b>preroll</b>	>= 1 sec.
<b>edit lag (edit delay)</b>	7 frames
<b>postroll</b>	1 sec.



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